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OIL OF CAMPHOR.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 52.

By Henry Trimble and Hermann J. M. Schroeter.

Read at the Pharmaceutical Meeting, May 21.

From the literature of camphor oil we find that no two investigators have obtained the same or even similar results. The physical descriptions of the oil are so different as to lead one inevitably to the conclusion that the commercial oil is a variable article. With this idea in mind we collected eight samples from different sources in Philadelphia and New York, and first made a preliminary examination of them with the following results:

No. I. was obtained of Mr. Samuel F. Simes of Philadelphia, who assured us that this sample correctly represented the crude oil from Japan. It had a reddish-brown color, a specific gravity of 0·9632 at 16° C., and a boiling point of 180° C. The odor strongly resembled that of camphor and sassafras.

No. II. from Fritzsche Brothers, New York, was of a darker brown color, much darker than No. I. It had a specific gravity of 0·9819 at 16° C., boiling point of 180° C., and an odor of camphor and sassafras.

No. III. was likewise from Fritzsche Brothers, and was marked "German." It had a sp. gr. of 0·8877 at 16° C., and a boiling point of 170° C. It was colorless, with terebinthinate and mild camphor odor.

No. IV. from a wholesale drug firm of Philadelphia was probably

the same as No. III., as its boiling point was the same, its sp. gr. 0·8863 at 16° C., and its other physical properties identical.

No. V. from a dealer in New York was no doubt the same as III. and IV, as it only differed by having the sp. gr. of 0·8803 at 16° C.

No. VI. from a New York importing firm, *marked "rectified,"* had a sp. gr. of 1·006 at 16° C., and boiled at 210° C. Its color was a light yellow, and odor that of sassafras and slightly camphoraceous.

No. VII. from wholesale druggists of Philadelphia was similar to No. VI., with a sp. gr. of 0·9903, boiling point of 206° C., and somewhat darker color.

No. VIII., also from a wholesale drug firm of Philadelphia, was dark reddish brown, with an empyreumatic and camphoraceous odor, a sp. gr. of 0·9546 at 16° C., and a boiling point of 198° C.

They all had an acid reaction; all were miscible in all proportions with 95 per cent. alcohol.

As I. and II. appeared to represent the crude product, they were taken for analysis. No. I. we were able to get in considerable quantity, and in most of the following work it was used.

The remaining samples were submitted to fractional distillation *in vacuo*, and samples III., IV. and V. were found to contain from 1–3 per cent. of camphor in solution in the light fractions of camphor oil. Samples VI. and VII. consisted of the intermediate portions of the commercial oil, the lowest and highest boiling fractions being entirely absent. Sample VIII. contained all the fractions, the lightest in smaller quantity only, but it was quite empyreumatic, and yielded a considerable quantity of a solid residue at 235° C. Each sample was submitted to the action of polarized light, I., II. and VIII. being first decolorized with animal charcoal. The following readings were obtained with the 200 mm. tube in a Wild polaristrobometer:

1.	+ 49°.	5.	+ 62.2°.
2.	+ 32.6°.	6.	+ 28.6°.
3.	+ 61°.	7.	+ 38.2°.
4.	+ 62.2°.	8.	+ 1°.

The following results, it will now be understood, apply to sample No. 1. An alcoholic solution of ferric chloride produced no change when mixed with the oil, and negative results were likewise gotten with saturated solution of sodium bisulphite and with alcoholic ammonium sulphide. Alcohol and fixed oils were found to be absent from the sample.

On agitating the oil with water the latter absorbed the acidity, which was found by appropriate tests to be due to acetic and formic acids. The same portion of oil after agitation with water was boiled for some hours with an aqueous solution of potassium hydrate in a flask attached to an inverted condenser. The resulting potassium compound, decomposed by a mineral acid, separated into two layers. The aqueous layer was distilled, and in the distillate butyric acid was found, besides acetic and formic acids as above.

Three litres of the oil were fractionated *in vacuo* and the distillate collected in four portions as follows:—

1.—20	per cent.	obtained	between	90°–110° C.	*in vacuo*,	or	180°–200° C.	ord. pres.
2.—35	"	"	"	110°–120° C.	"		200°–210° C.	"
3.—25	"	"	"	120°–130° C.	"		210°–220° C.	"
4.—20	"	"	"	130°–150° C.	"		220°–240° C.	"

A small amount of resinous residue remained. A quantity of the oil was also distilled at ordinary pressure, but this method resulted in decreasing the amount of the higher boiling fractions and rendering them more empyreumatic. It was found, however, after the original oil was once fractioned, that the lightest portions could with advantage be distilled at the ordinary pressure, but those of higher boiling points decomposed and the use of the vacuum was continued with them through all the rectifications. By redistilling the above four fractions, the lightest ones over sodium, until nearly constant boiling points were obtained, the following fractions resulted:

	Boiling point.
Fraction A.—145°–155° C.	
" B.—158°–161° C.	159°
" C.—161°–167° C.	
" D.—167°–169° C.	168°
" E.—170°–171° C.	171°
" F.—171°–175° C.	
" G.—175°–177° C.	176°
" H.—177°–180° C.	
" J.—180°–182° C.	180°
" K.—182°–202° C.	
" L.—202°–206° C.	204°
" M.—206°–212° C.	
" N.—212°–214° C.	213°
" O.—214°–230° C.	
" P.—230°–235° C.	232°
" Q.—235°–245° C.	
" R.—245°–248° C.	247°
" S.—250°–280° C.	Green oil

It had better be explained that the fractions P, Q, R and S were not the result of fractional distillation alone, but were obtained by treatment to be hereafter explained from fresh portions of the oil. Only those fractions having constant boiling points were examined. All the polariscope readings were made in the 200 mm. tube, confirmed by the use of the 100 mm. tube. The vapor densities were made with the Victor Meyer apparatus. The combustions were carried out in an open tube with cupric oxide and a stream of oxygen. Over ninety combustions were made during the progress of the work which has been carried on uninterruptedly since last December.

Fraction A. 145–155° C.—This fraction was found only in small quantity, having strong terebinthinate odor, of sp. gr. 0·8593 at 16° C., and dextro-rotary = +53°. It was submitted to combustion with following results:

I. 0·100 gm. substance yielded 0·3235 gm. CO_2 and 0·106 gm. H_2O.

II. 0·141 gm. substance yielded 0·453 gm. CO_2 and 0.146 gm. H_2O.

Calculated for $C_{10}H_{16}$.	Found.	
	I.	II.
C—88·23	88·22	87·62
H—11·77	11·77	11·51
100·00	99·99	99·13

Vapor density:

I. 0·1152 gm. subst. vaporized replaced 21 cc. air =4·70.
II. 0·1012 " " " " 18·1cc. " =4·73.
Calculated for $C_{10}H_{16}$.=4·71.

Fraction B. 158–161° C., *b. p.* 159° C.—This fraction of constant boiling point possessed fragrant and terebinthinate odor, of sp. gr. 0·8616 at 16° C., and dextro-rotary=+54°.

Combustions as follows:

I. 0·109 gm. subst. yielded 0·350 gm. CO_2 and 0·114 gm. H_2O.
II. 0·111 " " " 0·358 " CO_2 and 0·1175 " H_2O.

Calculated for $C_{10}H_{16}$.	Found.	
	I.	II.
C—88·23	87·57	87·96
H—11·77	11·62	11·76
100·00	99 19	99·72

Vapor density:

I. 0·1168 gm. subst. replaced 21 cc. air = 4·76.
II. 0·1050 " " " 18·7 cc. air = 4·67.
Calculated for $C_{10}H_{16}$ = 4·71.

Fraction D. 167–169°, *b. p.* 168° *C.*—In somewhat larger quantity than Fraction B, of fragrant odor, colorless, sp. gr. 0·8678 at 16° C., and dextro-rotary = +56·9°.

Combustions as follows gave results for a hydrocarbon:

I. 0·1185 gm. yielded 0·381 gm. CO_2 and 0·124 gm. H_2O.
II. 0·129 gm. " 0·415 gm. CO_2 and 0·1355 gm. H_2O.

Calculated for $C_{10}H_{16}$.	Found.	
	I.	II.
C—88·23	87·68	87·74
H—11 77	11·63	11·67
100.00	99·31	99·41

Vapor density:

I. 0.155 gm. subst. replaced 28 cc. air=4·72.
II. 0·172 gm. " " 31·3 cc. air=4·68.
Calculated for $C_{10}H_{16}$=4·71.

Fraction E. 170–171° C., *b. p.* 171° C.—Of this fraction only a small quantity could be separated, but it consisted of a distinct fraction, with constant boiling point of 171° C. The specific gravity was found to be 0·8737 at 16° C., colorless, fragrant odor and dextro-rotary = +584°.

Combustions gave results as follows:

I. 0·116 gm. subst. yielded 0·3745 gm. CO_2 and 0·1221 gm. H_2O.
II. 0·1341 gm. " " 0·4315 gm. CO_2 and 0·1409 gm. H_2O.

Calculated for $C_{10}H_{16}$.	Found.	
	I.	II.
C.—88·23.	88·05	87 76
H.—11·77.	11.69	11 67
100·00	99·74	99·43

Vapor density:

I. 0·1155 gm. subst. replaced 21 cc. air=4·67.
II. 0.1231 gm. " " 22·5 cc. air=4·65.
Calculated for $C_{10}H_{16}$=4·71.

Fraction G. 175–177° C., *b. p.* 176° C.—This fraction was separated without much difficulty, in large quantity and very constant. It was colorless, strong pleasant odor, resembling cajeput, of sp. gr. 0·8824 at 16° C., and strongly dextro-rotary= +62°.4.

The following combustions and vapor densities give it the formula $C_{10}H_{18}O$:

I. 0·1635 gm. subst. yielded 0·467 gm. CO_2 and 0·168 gm. H_2O.
II. 0·1684 gm. " " 0·4813 gm. CO_2 and 0·1733 gm. H_2O.

Calculated for $C_{10}H_{18}O$.	Found.	
	I.	II.
C—77·92	77·89	77·94
H—11·69	11·42	11 44
O—10·39	10 69	10·62
100·00	100·00	100·00

Vapor Density:

I.—0·164 gm. subst. replaced 26·4 cc. air = 5·28.
II.—0·1724 gm. " " 27·4 cc. air = 5·35.
Calculated $C_{10}H_{18}O$ = 5·33.

Fraction J.—180–182°, *b. p.* 180° C.—Fraction of oil boiling between 185–200° C., on repeated distillation over sodium, gave a small

portion of quite constant boiling point, which was with much difficulty obtained quite pure. It a had fragrant odor, was colorless, with sp. gr. 0·8933 at 16° C., and of strong dextro-rotary power = 64·8°.

Combustions gave results as follows:

I. 0·1400 gm. subst. yielded 0·4481 gm. CO_2 and 0.147 gm. H_2O.
II. 0·1475 " " " 0.4740 gm. CO_2 and 0.1540 gm. H_2O.

Calculated for $C_{10}H_{16}$.	Found.	
	I.	II.
C—88·23	87·29	87·64
H—11·77	11·67	11·60
100·00	98·96	99·24

Vapor density:

I. 0·1434 gm. subst. replaced 25·5 cc. air = 4·80.
II. 0·1282 " " " 22·9 cc. air = 4·78.
Calculated for $C_{10}H_{16}$ = 4·71.

Fraction L. 202–206° C., *b. p.* 204° C.—Between 200°–208°C., on repeated distillation, solid camphor separated, which formed in the receiver a semifluid mass. On separating the fluid portion and drying the crystals, they gave on analysis results for camphor. An alcoholic solution was found to possess dextro-rotary power.

Results of combustions:

I. 0·1975 gm. subst. yielded 0·5716 gm. CO_2 and 0·1930 gm. H_2O.
II. 0·205 " " " 0·590 " CO_2 and 0·1940 gm. H_2O.

Calculated for $C_{10}H_{16}O$.	Found.	
	I.	II.
C—78·94	78 93	78·49
H—10·53	10·85	10·51
O—10·53	10·22	11·00
100 00	100·00	100·00

Vapor density:

I. 0·083 gm. subst. replaced 13·5 cc. air = 5·28.
II. 0·115 " " " 18·9 cc. air = 5·23.
Calculated for $C_{10}H_{16}O$ = 5·26.

Fraction N. 212–214° C., *b. p.* 213° C.—The portion boiling at 208–220° C., on rectification, gave a fraction boiling at 212–214° C. Before it was rectified it was placed in a freezing mixture, the separated camphor removed, and on redistilling more camphor separated out in the receiver. This was the case invariably on redistilling the oil after the camphor had been removed. On separating the camphor as near as possible by the use of a freezing mixture, the fraction boiling at 212–214° C. gave the following results, corresponding to the formula $C_{10}H_{18}O_2$.

It was colorless, of mild camphor odor, sp. gr. 0·9802 at 16° C., and dextro-rotary = + 53·4°.

Combustions:

I. 0·1830 gm. subst. gave 0·4750 gm. CO_2 and 0·1717 gm. H_2O.
II. 0·1935 " " " 0·5010 " CO_2 and 0·1840 gm. H_2O.

Calculated for $C_{10}H_{18}O_2$.	Found.	
	I.	II.
C—70 59	70·78	70·61
H—10·59	10·43	10·56
O—18·82	18.79	18 83
100·00	100·00	100·00

Vapor density:

I. 0·1620 gm. subst. replaced 23·5 cc. air = 5·92.
II. 0·1540 " " " 22·5 cc. air = 5·88.
Calculated for $C_{10}H_{18}O_2$ = 5·89.

Fraction P. 230–235° C., *b. p.* 232° C.

It was with great difficulty that a compound with constant boiling point was obtained, and when obtained, it was found still to exert a perceptible action on polarized light. As by simple fractionation the desired result could not be obtained, several litres were treated with an aqueous solution of potassium hydrate, and the light portion distilled off in a vacuum. From that remaining in the still, the aqueous

solution of potassium hydrate was separated, and the oil distilled in vacuo. That portion which would have distilled at the ordinary pressure at 230–250° C., was collected, and on repeated rectification, at ordinary pressure, a fraction boiling between 230–235° was obtained. It had the physical and chemical properties of safrol. It was colorless, highly refractive, with the characteristic sassafras odor, of sp. gr. 1·101 at 16° C., and almost inactive on polarized light= + 1·8°.

Results of combustions as follows:

I. 0.1862 gm. subst. yielded 0·507 gm. CO_2 and 0·1050 gm. H_2O.
II. 0 1921 " " " 0·5192 " CO_2 and 0·1130 gm. H_2O.

Calculated for $C_{10}H_{10}O_2$	Found.	
	I.	II.
C—74·07	74·26	73·71
H— 6·17	6.26	6·53
O—19·76	19·48	19·76
100·00	100·00	100·00

Vapor density:

I. 0·1823 gm. subst. replaced 28 cc. air = 5·59.
II. 0·1670 " " " 25·8 cc. " = 5·56.
Calculated for $C_{10}H_{10}O_2$ = 5·61.

Fraction R. 245°–248° C., *b. p.* 247° C.

Three litres of the oil were treated with aqueous solution of moderately strong potassium hydrate, and subjected to distillation in vacuo, until the lighter boiling fractions were removed. The aqueous solution containing the eugenate of potassium was separated and decomposed by a mineral acid. The separated, dark, oily layer collected, dried and rectified in vacuo, gave a product with a boiling point at the ordinary pressure of 247° C. It had a yellowish color, becoming darker on exposure to light, was strongly refractive, with a decided odor of cloves and a sharp burning taste.

It had a specific gravity of 1·057 at 16° C., and was almost inactive on polarized light= +1·4°.

Results of analysis gave the formula $C_{10}H_{12}O_2$.

I. 0·2258 gm. subst. gave 0·607 gm. CO_2 and 0·1475 gm. H_2O.
II. 0·1788 " " " 0·4805 gm. CO_2 and 0·120 gm. H_2O.

Calculated for $C_{10}H_{12}O_2$.	Found.	
	I.	II.
C.—73·17	73·31	73·29
H.— 7·32	7·26	7·45
O.—19·51	19·43	19·26
100·00	100·00	100·00

Vapor density:

I. 0·2135 gm. subst. replaced 32 cc. air=5·74.
II. 0·1820 gm. " " 27·2 cc. air=5·76.
Calculated for $C_{10}H_{12}O_2$=5·68.

Fraction S. 250–280° C.—The treatment of the oil with potassium hydrate gave a larger quantity of this high boiling fraction than the direct distillation of the oil. It had a bluish green color, which with No. I. oil was not permanent, but changed on several days standing to violet, afterwards to pink and then to light-brown. The same fraction from No. II. oil was darker colored and has not faded as yet. A three per cent. solution of the fraction, boiling at 260° to 280° C., in glacial acetic acid, gave a fine violet color on the addition of a few drops of concentrated sulphuric acid. According to Wallach this would indicate a sesquiterpene. The quantity, however, was too small to determine whether it was a definite compound or not.

From the above results we conclude that the following distinct and definite compounds exist in this sample, with a close approximation of the quantity of each:

	Boiling point.	Per cent.	Formula.
(1). From 145°–155° C.	150°	0·40	$C_{10}H_{16}$
(2). " 158°–161° C.	159°	12·00	$C_{10}H_{16}$
(3). " 167°–169° C.	168°	13·00	$C_{10}H_{16}$
(4). " 170°–171° C.	171°	5·00	$C_{10}H_{16}$
(5). " 175°–177° C.	176°	15·00	$C_{10}H_{18}O$
(6). " 180°–182° C.	180°	4·00	$C_{10}H_{16}$
(7). " 202°–206° C.	204°	10·00	$C_{10}H_{16}O$
(8). " 212°–214° C.	213°	30·00	$C_{10}H_{18}O_2$
(9). " 230°–235° C.	232°	7·00	$C_{10}H_{10}O_2$
(10). " 245°–248° C.	247°	2·00	$C_{10}H_{12}O_2$
(11). " 250°–280°		1·60	Green oil.

We do not consider that the above lighter fractions have been so satisfactorily identified, as to warrant naming them. The others have already been named by previous investigators, and were fully identified by us. It is possible that (6) consists of dipentene, since Wallach discovered considerable quantities of it in the camphor oil. (5) may be cineol, but we have been unable to get all the reactions necessary for its identification. The odor, however, is characteristic and strongly points to the possibility of cineol being present, but the polarization is decidedly different from that obtained from wormseed oil, which is inactive. Recently there has appeared a statement of the composition of camphor oil by Schimmel & Co.[1]

Our work, however, was nearly completed, as far as now published, when the above pamphlet was issued. The results in part agree, and we can only say that probably they are as similar as might be expected from different investigators on different samples of such a varied substance as this oil appears to be.

Another important paper on the composition of camphor oil was published in 1885, by Yoshida,[2] who found it to consist of terebinthene, citrene, camphor and camphorogenol. Had we used sample of oil No. VI. for the basis of our work the results would probably have approached his. He in turn failed to find in his sample the compound noted by Oishi,[3] who, in addition to camphor, found a hydrocarbon of the composition $C_{12}H_{20}$. We cannot but conclude that these two gentlemen experimented on the true oil, since they carried on their investigations near its source. Since it has become known that the high boiling fractions of the oil are so valuable, it will be safe to conclude that the colorless rectified oils of low specific gravity do not contain all the compounds which naturally belong in this complex substance.

PHILADELPHIA, May 21, 1889.

Colchicine is recommended by Dr. Darier in certain eye affections, and is administered in pill form, each pill containing $\frac{1}{64}$ grain of the drug of which from 1 to 2 or 4, or even 6 pills, can be taken daily. Care must be taken to instruct patients to reduce the dose as soon as intestinal derangements manifest themselves. Some patients have taken as many as 200 pills, without complaining of unfavorable symptoms.—*Med. News*, March 3, 1889.

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[1] Bericht von Schimmel & Co., Leipzig, April, 1889. See this Journal, page 313.

[2] *Jour. Chem. Soc.*, 47, 779.

[3] *Jour. Soc. Chem. Industry*, 2, 353.

EUONYMUS ATROPURPUREUS.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 53.

By Frank V. Cassaday, Ph.G.

As there has been no complete analysis made of the root bark of Wahoo, the following investigation was undertaken with a view of determining all the important constituents, and adding, at the same time, to what is already known about the active principles.

The analysis of Clothier (Am. Jour. Pharmacy, Nov., 1861), showed the presence of sugar, starch, etc., and, by agitating the tincture with chloroform, "yellow crystals," which were very bitter, soluble in chloroform and boiling alcohol, and of a neutral reaction, were obtained. These results were in part confirmed by Wenzell (Am. Jour. Pharmacy, Sept., 1862), and he added *euonic acid* to the list of constituents, although he did not find the *euonymin* of Clothier to be crystalline. Miller (Am. Jour. Pharmacy, Sept., 1878) added a volatile oil to the list, and with a larger quantity of the euonymin determined it to be uncrystalline.

By my method of procedure the drug was exhausted by cold maceration with petroleum ether, which yielded 0·06 per cent. of volatile oil and 1·24 per cent. of a wax-like body melting at 42° C., sparingly soluble in absolute alcohol, less so in 95 per cent. alcohol, but freely soluble in ether and chloroform.

The drug then yielded to stronger ether a dark-brown substance representing 1·5 per cent. This residue was partly soluble in water, the solution having an acid reaction. This aqueous solution was warmed with barium carbonate until the evolution of CO_2 ceased, filtered and the filtrate slowly evaporated over sulphuric acid, but no crystals formed. On redissolving, treating with dilute sulphuric acid until all the barium precipitated, and agitating with ether, crystals were obtained from the ethereal solution. These crystals were found to be strongly acid with a sour astringent taste. They gave no peculiar reactions with a number of reagents tried, but from their general characters were undoubtedly the euonic acid of Wenzell.

Tests on the ethereal extract for glucosides, alkaloids, gallic and tannic acids gave negative results. The resin, after separation of euonic acid was found to be sparingly soluble in 95 per cent. and absolute alcohol, soluble in aqueous solution of sodium hydrate, from which it was precipitated on the addition of an acid.

Absolute alcohol extracted from the original drug 2·16 per cent., 1·58 per cent. was soluble in water, to which it imparted an acid reaction due to euonic acid. Negative results were gotten for tannic acid, alkaloids and glucosides. Ether was the only one of a number of solvents agitated with the above aqueous solution that extracted anything, and it on evaporation yielded a dark-brown, amorphous mass, having a very bitter and somewhat benumbing taste. This, no doubt, represented the euonymin of previous investigators. The insoluble part of the alcoholic extract consisted of an acid resin apparently identical with that found in the ether extract of the drug.

It will be seen from the results so far that in order to obtain the two active principles of Wahoo, it should first be exhausted with ether to extract euonic acid, and then with alcohol to obtain euonymin. The method used by Carpenter and Wenzell of making a tincture with diluted alcohol and agitating with chloroform was also tried on a much larger quantity of the drug, but in this way mixtures of the two principles were obtained, which would account for Carpenter stating that the active constituent was crystalline with a bitter taste, as he, no doubt, had the crystals of euonic acid mixed with the very bitter euonymin. The remaining results which are much the same as those previously noted by Miller are given in the following summary:

Volatile oil and wax	1·30	per cent.
Euonic acid and resin	1·48	"
Euonymin and resin	2·16	"
Mucilage	1·50	"
Dextrin	5·53	"
Saccharose	1·88	"
Albumenoids and pectin	8·34	"
Calcium oxalate	1·20	"
Coloring, etc., extracted by chlorine water	6·66	"
Ash	11·65	"
Moisture	9·25	"
Cellulose, lignin and loss	49·05	"
Total	100·00	"

Amylene hydrate has been observed by Dr. Jumon (*La France Méd.*) to produce a period of excitement which is quickly followed by sleep. The dose as a hypnotic is three grams. See also AMER. JOUR. PHAR., 1888, p. 584.

SO-CALLED AMBER GUAIAC.

By C. Carroel Meyer, Ph. G.

Read at the Pharmaceutical Meeting, May 21st.

A short time ago I received some guaiac from a prominent wholesale drug house, which was so entirely different in appearance from that usually found in the market (being perfectly clear and free from pieces of wood and bark), I concluded to see if it was pure guaiac. The name given it by the trade is amber guaiac. Its slight resemblance to black pitch (pix nigra), caused me to think pitch was a possible adulterant, also its transparency might be due to resin (Resina, U. S. P.). A given quantity of amber guaiac and black pitch were treated separately in solution of potassa, amber guaiac being completely soluble, black pitch but slightly. Then on burning the two there is an entirely different odor, showing pitch not to be an adulterant. The amber guaiac was treated with hot oil of turpentine, and remained undissolved, showing it was not mixed with resin.

Four fluidounces of tincture were made up with amber guaiac and ordinary guaiac; 275 grains of guaiac of the shops was used to make 4 oz. of tincture (that being about the strength of U. S. P.). It was left standing for over two weeks, being agitated frequently, filtered through tared filter paper, and found to leave 102⅝ grs. undissolved, a little over sixty per cent. of the guaiac used being soluble.

The same quantity of amber guaiac was treated in same manner, and found to be almost completely soluble, leaving about 14 grs. or five per cent. undissolved. Amber guaiac is also completely soluble in aromatic siript of ammonia, and the tincture gives the characteristic blue color with fumes of nitric acid.

The U. S. Dispensatory, page 730 states, amber is said to be an adulteration. Professor Maisch states in his "Materia Medica," that amber is almost insoluble in alcohol, and as amber guaiac is almost completely soluble, that proves amber is not an adulterant. Now the point I wish to make is this: If we can get guaiac that is so soluble should we not use less in making the officinal tincture?

Philadelphia 5, 21, 1889.

Toothache drops.—Morphine acetate, ½-1 grain; oil of peppermint, 5 drops; phenol, 20 drops; collodion, 1 drachm. Apply with cotton.—*Jour. de Méd.*

ABSTRACTS FROM THE FRENCH JOURNALS.

Translated for the AMERICAN JOURNAL OF PHARMACY.

OINTMENTS WITH TRAGACANTH.—In preparing ointments composed of vaselin, glycerin, oxide of zinc and gum tragacanth it is indispensable, says M. P. Vigier, to add a small amount of water, but this should be done with certain precautions. He advises that the gum be triturated with the glycerin and a small quantity of water, and the mass thus obtained mixed with the oxide of zinc already made into an ointment.—*Soc. de Phar. de Paris*, April 3.

MERCURIAL OINTMENT WITH GLYCERITE OF STARCH.—This mixture, says M. Preud'homme, is not homogeneous as ordinarily prepared, but may be made so by the addition of a small quantity of lanolin.—*Soc. de Phar. de Paris*, April 3.

ACTION OF GLYCERIN UPON VULCANIZED RUBBER.—M. Morellet states that vulcanized rubber dipped suddenly into boiling glycerin takes the characters of non-vulcanized rubber, *i. e.*, that its parts can readily be joined and that it dissolves in the usual solvents of caoutchouc. The glycerin must be boiling at the time of first contact.—*Soc. de Phar. de Paris*, April 3.

PETROLEUM SOAP.—At the request of Dr. C. Paul, M. Emery has made a petroleum soap suitable for therapeutic uses. The formula is as follows: Petroleum, 50 parts; white beeswax, 40 parts; alcohol of 90 per cent. 50 parts; hard soap (*Savon de Marseille*), 100 parts. The petroleum, wax and alcohol are put together into a matrass and heated in a water-bath until they melt; the soap is then added. When the mixture becomes homogeneous the matrass is removed and agitated until the contents become of a creamy consistence; it is then poured into molds. It is not absolutely necessary to use ethylic alcohol, which serves merely to facilitate the reduction of the wax and the soap. The soap thus obtained contains about one quarter of its weight of petroleum. It is very homogeneous and firm, and emulsifies easily. Parts washed with it do not remain impregnated with petroleum, as is ordinarily the case in preparations of this kind.—*Répert. de phar.*, May 10.

STROPHANTATE OF LIME.—The diuretic properties of this preparation have been pointed out by M. Catillon (AMERICAN JOURNAL OF PHARMACY, 1889, p. 137); its characters are described as follows in a report to the *Soc. de Thérap.:* This compound is tasteless, deliquescent and of an alkaline reaction; sulphuric acid gives with it an abundant precipitate of sulphate of lime; carbonic acid does not dis-

turb it; with oxalate of ammonia it gives oxalate of lime; solutions acidulated with hydrochloric acid are precipitated by iodohydrargyrate of potash and phosphomolybdate of soda. "It is this reaction—common to alkaloids—which lead certain authors to believe that strophanthus contained an alkaloid." In treating a concentrated solution of strophantate of lime with sulphuric acid until a cessation of precipitate, filtering, then precipitating with a large excess of alcohol, and in again taking up the precipitate with alcohol of 70 per cent., M. Catillon isolated the azotized substance which was combined with lime.—*Répert. de phar.*, April 10.

PHENATE OF CAFFEINE.—The mixing of equal equivalents of pure phenol and crystallized caffeine gives a true crystalline combination which is very soluble in water. Concentrated solutions of this produce no irritation when applied to mucous membranes. For hypodermic injections a solution of 10 per cent. phenic acid, with q. s. of caffeine may be used.—M. A. Petit; *J. de ph. et de ch.*, April 1.

INCOMPATIBILITY OF ACID FRUIT SYRUPS WITH CAFFEINE AND BENZOATE OF SODA.—M. Raynaud wished to keep a preparation of caffeine and benzoate of soda in gooseberry syrup. The mixture was at first clear; but long, needle crystals were soon deposited upon the sides of the container, and these he found to be of benzoic acid. The remedy consists in adding a small quantity of bicarbonate of soda to solutions of caffeine previously made soluble by the addition of benzoate of soda.—*Bull. de ph. de Lyon; Répert. de Phar.*, April 10.

INCOMPATIBILITY OF DRY ANTIPYRINE AND SALICYLATE OF SODA.—M. P. Vigier finds that if these substances are mixed dry, as for cachets, an oily body forms within a few hours, thus injuring the powder or cachet, and showing in fact an undesirable decomposition. The reaction of the formed substance is alkaline. The reaction of aqueous solutions of these bodies is, when united, slightly acid. Mixed solutions of antipyrine and salicylate of soda remain limpid indefinitely and without apparent change.—*Répert de Phar.*, May 10.

DECOMPOSITION OF IODOFORM SOLUTIONS.—Ethereal solutions of iodoform become very unstable as they approach saturation. In solutions of alcoholized ether, decomposition is retarded, but it occurs —setting free iodine—even when the solution is kept from the action of light. The altered solution may be agitated with a globule of mercury which unites with the free iodine, and the ethereal solution, no longer saturated, becomes more stable. Chloroformic solutions

act in the same way.—*Jour. de Méd. de Bordeaux; Répert. de phar.*, May 10.

Iodoform Poisoning in Children.—Dr. Cazin reports two cases of children who had toxic symptoms after applications of iodoform dressings following surgical operations. In one of them "the symptoms took a comatose and in the other a meningitic form." After a modification of the dressings the symptoms disappeared. Dr. Cazin thinks that iodoform should be used with the greatest caution in dressing open wounds of children.—*Répert. de phar.*, April 10.

Beta Naphthol Dressings.—1. *Weak solution*, for parts in which membranous portions are exposed: Naphthol β, 5 gm.; alcohol at 60°, 1 litre. 2. *Ordinary solution:* Naphthol β, 15 gm.; alcohol at 60°, 1 litre. 3. *Strong solution*, for touching diseased portions of the skin, or septic excoriations; Naphthol β, 15 to 500 gm. per litre. 4. *Solution for interstitial injections, or closed septic cavities:* Naphthol β, 5 gm.; alcohol at 90°, 33 gm.; hot, distilled water, to make 100 ccm.; filter and use warm. A few drops may be injected into indurated glands or abscesses.—*Le Praticien*, April 8.

Beta Naphthol for Internal Use.—The following formula is said to be frequently prescribed by Dr. Dujardin-Beaumetz in cases of dilatation of the stomach, or to combat secondary fermentation in the stomach and intestines: Beta naphthol, salicylate of bismuth and calcined magnesia, āā 10 gm.; divide in 30 cachets; one before each of the two principal meals—*Jour. de Méd.*, April, 1889.

New Reaction of Cupric Salts.—This is based upon the easy transformation of the salts of copper to cupric bromide, under the influence of bromide of potassium, and upon the dehydration, by sulphuric acid, of the salt produced, this being manifested—with bromide of potassium in excess—by a fine coloration of violet red. The reaction is very sensitive, and may also be produced in saline solutions of other metals, such, for instance, as nickel and cobalt. To 2 ccm. of a cold, saturated solution of bromide of potassium, 1 ccm. of concentrated sulphuric acid is added, and the mixture is agitated; the lower portion becomes yellow, but this color disappears on agitation if the bromide be free from bromate. Then, two or three drops of the solution to be tested for copper is added. However small may be the quantity of copper present, a carmine coloration is produced; this brightens with heat, and disappears under the addition of water, which hydrates the cupric bromide. The same action is produced with solid

cupric salts. The solution to be tested should first be acidulated with sulphuric acid so as to precipitate the metals, if any, as insoluble sulphates. The reagent may be prepared in advance by adding to a saturated solution of bromide of potassium, half its volume of pure sulphuric acid. This is stirred and filtered through asbestos, so as to separate the sulphate of potash precipitate which forms.—M. Denigès, *Bull. de la Soc. de Phar. de Bordeaux*, March.

BROMIDE OF GOLD IN THERAPEUTICS.—In a memoir lately recompensed by the *Académie de Médecine*, Dr. Goubert describes his successful treatment by this salt of epilepsy and the various forms of migraine. He says that bromide of gold is better tolerated than are the other bromides, though too high doses determine "a not severe cephalalgia without somnolence." The dose for adults is 8 mgm., gradually increased to 12 mgm.; for children, 3 to 6 mgm. The author administered the salt in weak solution. He states that "the action of this medicament is durable, and epileptics who have taken it sometimes remain for several years free from the attacks."—*Répert. de phar.*, April 10.

GLEANINGS FROM THE GERMAN JOURNALS.

BY FRANK X. MŒRK, PH. G.

Assay of Mercurial Ointment.—1. Weigh 3 gm. of the ointment into a small tared flask, add 50 cc. alcoholic potassium hydrate solution and heat in a water-bath; after a short time the fat is saponified and the solution can be easily poured off from the separated mercury, which is washed a few times with alcohol, finally with ether, and then the flask and contents are dried and weighed.—Kremel, *Pharm. Post*, 1889, 227.

2. To one gram ointment weighed into a small beaker are added 60 gm. ether, 5 gm. alcohol and 6 to 8 drops hydrochloric acid, to facilitate solution of the fat slight heat is applied; the beaker is covered with a watch-crystal and allowed to stand until the liquid becomes clear, when it is carefully decanted from the metallic deposit, the latter washed by decantation with some of the above mixture, finally with ether, dried at 30° to 40° and weighed.—E. Dieterich (*Helf. Ann.*) *Pharm. Centralhalle*, 1889, 267.

Veratrum alkaloids can be estimated by extracting 5 gm. of the root with a mixture of equal volumes of chloroform and absolute alcohol; the solution is agitated several times in a separating funnel

with water acidified with hydrochloric acid, the acid solution filtered, rendered alkaline with solution of potassa and shaken in a separating funnel with three successive portions of chloroform; the chloroformic solution is evaporated in a tared beaker, dried at 100° and weighed. From 1·3 to 1·5 per cent. alkaloids are obtained, consisting of jervine and veratroidine; white scales and microscopic prisms make up the crystalline forms.—Kremel, *Pharm. Post*, 1889, 227.

Emulsions.—Hecker recommends the use of mucilage of acacia and powdered sugar in making this class of preparations instead of powdered acacia and water, and states that an emulsion can be made as quickly by this method as an ordinary mixture. It is immaterial in which order the substances are placed in the mortar as by active stirring the familiar "crackling" sound of a perfect emulsion is almost immediately heard; no apprehension need be felt of such an emulsion separating into layers in less than twelve hours. For 10 gm. of the substance to be emulsified are taken: *castor oil*, 10 gm. mucilage and 5 gm. powdered sugar; *almond, poppy, olive* and *cod-liver oils*, 15 gm. mucilage and 5 to 10 gm. powdered sugar; *volatile oils*, 25 gm. mucilage and 10 gm. powdered sugar; copaiba and Peru balsam, 15 gm. mucilage and 5 gm. sugar. For *resins, gum-resins* and *ethereal extracts* an equal weight of mucilage is desirable so as to have a consistent method of preparing emulsions.—*Pharm. Post*, 1889, 229.

An increased solubility of quinine salts in presence of antipyrine was noticed by Triulzi (Boll. Farm.); if 1 gm. hydrochlorate of quinine be heated with 0·4–0·5 gm. antipyrine and 2 gm. water solution takes place at 25–30° C.; with 0·2–0·25 gm. antipyrine at 44–50°; 1 gm. hydrochlorate of quinine with 2 gm. water dissolves at 52 to 56°; on cooling only the last solution deposits the quinine salt. Similar results were obtained with valerianate of quinine. This observation may be of value in preparing neutral quinine solutions for subcutaneous injections.—J. Blabol, *Rdsch.*, 1889, 303.

Oleum Cantharidum.—Heat over a moderate fire 0·3 gm. cantharidin with 20 gm. castor oil and 40 gm. rape oil in a small porcelain dish until solution is effected and then dilute to 200 gm. with rape oil; the addition of the castor oil prevents the separation of the cantharidin.—F. Eger, *Pharm. Ztg.*, 1889, 213.

Methacetin, a new antipyretic, is a lower homologue of phenacetin, having the formula $C_6H_4\begin{cases}OCH_3\\NHC_2H_3O,\end{cases}$ and is prepared in an analogous

manner. Para-nitrophenol is first prepared by action of nitric acid upon phenol; the sodium salt reacting with methyl chloride forms sodium chloride and nitranisol; by treatment with nascent hydrogen the nitranisol is reduced to anisidin (para-amidoanisol), which by boiling with glacial acetic acid is converted into *acetyl-anisidin* or methacetin. It forms a faint reddish crystalline powder, is odorless, has a saline bitter taste, is easily soluble in water and alcohol and melts at 127°. Methacetin possesses preservative and antipyretic properties. The dose for children should not exceed 0·3 gm., the smaller dose compared with phenacetin is due to its solubility, and hence easier absorption; after its use the urine gives the para-amidophenol reaction (in HCl solution with calcium hypochlorite a violet color, on agitation changing to green) and has reducing action which is not due to the presence of sugar.—F. Mahnert, *Pharm. Ztg.*, 1889, 228.

Acid nicotine tartrate was used by Dr. H. Dreser for experimental purposes instead of the easily resinifying and decomposing solution of the free alkaloid. It was prepared from the pure alkaloid and a concentrated solution of tartaric acid in alcohol, precipitating the salt completely with ether, dissolving the precipitate in a little boiling alcohol, and allowing the filtrate to cool slowly, by which means the impurities separate out first and are removed; the separation of the alkaloidal salt is made complete by the cautious addition of ether. The salt has the formula $C_{10}H_{14}N_2(C_4H_6O_6)_2 2H_2O$, forms white crystalline needles, easily soluble in water, the solution possessing an acid reaction.—*Arch. der Pharm.*, 1889, 266.

Ferric albuminate with sodium citrate is a scale preparation of iron from which a solution can be made without the use of acids or alkalies. To prepare the salt, 40 liters distilled water are heated to the boiling point and allowed to cool to 50°; to 20 liters are added 1200 gm. solution of oxychloride of iron (dialyzed iron); in the other 20 liters 300 gm. coarsely powdered dried egg albumen are dissolved by stirring, the solution strained and added to the iron solution; 40 gm. solution of soda are diluted with 360 gm. distilled water and with this the above mixture is very carefully neutralized (requires about 300 gm.). The precipitated ferric albuminate is washed by decantation with water which had been heated to 100° and cooled to 50° until the washings are free from chlorine, collected on a wet linen strainer and allowed to drain. 30 gm. citric acid are dissolved in 120 gm. distilled water and neutralized, applying heat,

with crystallized sodium carbonate (60–65 gm.); after cooling, this solution is added to the precipitate, which has been removed to a porcelain capsule, and after solution results this is strained and evaporated at a temperature not exceeding 40°, best in a vacuum, to a syrupy consistence, *poured* upon glass plates and, after drying, the scales removed. (If the syrupy liquid be *spread* upon the glass plates, the scales will become opaque, due to small air bubbles which coat the surface and cannot escape.) The scales are lustrous, dark garnet in color, permanent in air; soluble in half their weight of water to form an odorless, neutral solution with a slightly saline and only a faintly ferruginous taste. Contain 15 per cent. iron.

A neutral solution containing 0·42 per cent. iron is made by dissolving 28 gm. of the scales in 770 gm. distilled water, adding 100 gm. alcohol, 100 gm. spirit of cognac, 1·5 gm. each of the tinctures of ginger, galangal and Ceylon cinnamon, filtering after standing for 24 hours, and washing the filter with sufficient water to make the filtrate weigh 1000 gm.

Ferric peptonate with sodium citrate, containing 15 per cent. of iron, is made by dissolving the ferric peptonate prepared according to AM. JOUR. PHAR.. 1888, 514, in a cold solution made by neutralizing 3·5 gm. citric acid, dissolved in 12 gm. distilled water, with crystallized sodium carbonate (7 to 8 gm.); the solution is evaporated in a steam-bath to a syrupy consistence, and is spread upon glass plates. The scales are of a chocolate brown color, friable, odorless, easily soluble in water, the solution having a mildly saline, slightly ferruginous taste. To make the solution containing 0·42 per cent. iron, 28 gm. of the scales are dissolved by heating with 870 gm. distilled water, 100 spirit of cognac added, the solution filtered, and the filter washed with sufficient water to make the filtrate weigh 1000 gm.

Dialyzed iron with sodium citrate.—30 gm. citric acid are dissolved in 120 gm. distilled water and neutralized, applying heat, with 60-65 gm. crystallized sodium carbonate; to this solution add 1000 gm. solution oxychloride of iron (dialyzed iron), containing 3½ per cent. of iron, evaporate in a steam-bath to a syrupy consistence and spread upon glass plates; after drying at a temperature of 40° the scales are preserved in well-stoppered vessels. The compound contains 31-33 per cent. of iron, and forms dark red-brown hygroscopic scales, easily soluble in water yielding a neutral, mildly saline solution almost free from ferruginous taste.—E. Dieterich, *Pharm. Centralhalle,* 1889, 234.

Assay of coca leaves.—50 grams of the powdered leaves are mixed with water and 20 grams magnesia, dried at 60° and extracted with ether; the solvent is distilled off, the residue is exhausted with 2 per cent. hydrochloric acid (about 30 cc. are needed), the acid solution filtered and agitated with ether until coloring matter is no longer extracted, then rendered alkaline with ammonia and agitated with three successive portions of ether of 25 cc. each; after drying the ether with fused calcium chloride, the ethereal solution is separated, the ether distilled off and the residue weighed, after drying in a dessicator.—Van d. Marck, *Pharm. Ztg.*, 1889, 282.

Narceine.—The melting point is given by various investigators from 92° to 162°. E. Merck, in examining the narceine of commerce, found that all specimens contained acids, most frequently HCl and H_2SO_4, occasionally acetic acid, in addition to other organic impurities; one sample contained as much as 14 per cent. narceine hydrochlorate. In purifying the alkaloid it was found that the last portions of acid were only after great difficulty removed; the best results, although attended with considerable loss, were obtained by precipitating the hydrochlorate with ammonia, the alkaline hydrates or their carbonates. *Pure narceine* melts at 170-171°, beginning to decompose at the same temperature, possesses a faint alkaline reaction and has great affinity for the acids absorbing, when moistened, HCl from the atmosphere. The presence of the hydrochlorate lowers appreciably the melting point; for medicinal use, no preparation, containing meconin, or melting below 165°, should be employed.—*Chemiker Ztg.*, 1889, 525.

Cera amylata, pulverulent wax, is a pill excipient recommended by H. Hager for pills containing volatile or fixed oils, or substances difficultly miscible with water, as extract of male fern, menthol, guaiacol, creasote, etc. It is prepared by cutting with a thin sharp knife fine shavings of pure beeswax, exposing them for some days to the ordinary temperature to remove adhering moisture, weighing and mixing an equal weight of dry rice starch with one-half of the shavings in a porcelain mortar with rough surface; care must be taken that the temperature of the mixing does not exceed 16°C.; after powdering, the remaining half of the shavings are incorporated and trituration continued until a fine powder is obtained, which is at once sifted and placed in tight-fitting containers.—*Pharm. Ztg.*, 1889, 431.

Jeyes' creolin contains, according to a thorough examination by

Otto and Beckurts, hydrocarbons (boiling point, 190–359°), 59·6; phenols (boiling point, 200–310°), 10·4; pyridine bases, 0·8; abietic acid, 23; soda, 2·8; water, 3·4. The miscibility of this creolin with water is due to the presence of the resin soap; that there must be other substances producing the same results is evident from the fact that Artmann's creolin is free from resin or fat soap and still possesses this property.—*Pharm. Centralhalle*, 1889, 227.

INSECT FLOWERS.[1]

By Prof. Jos. Schrenk.

The author has investigated the structural characteristics of the commercial insect flowers, and has pointed out certain differences which may be useful in determining the purity of commercial insect powder, and also its origin. The most important results may be summarized as follows:

The stem of the Dalmatian plant (*Chrysanthemum cinerariæfolium*) consists in the ridges of collenchyma tissue, which is also found in the depressions in the Persian plant (*Chrys roseum*); but in a good insect powder fragments, composed of collenchyma cells, should be met with only sparingly.

Fragments of the involucral scales, composed of sclerenchyma cells, are much more numerous in the Persian than in the Dalmatian powder.

The outer surface and edges of the scales of the Dalmatian flowers contain numerous hairs consisting of a long cell with attenuated ends placed horizontally upon a one- to three-celled stalk. The Persian flowers are almost entirely glabrous, a white hoariness being found only at and near the base of the scales, and very few hairs near the apex; the hairs are of the same structure as the preceding, only the terminal cell being much longer.

These hairs are entirely absent from the involucre and stem of the so-called Hungarian or Russian daisy; but the scales contain hairs consisting of from four to ten cells and terminating with a much elongated thin-walled, or with an inflated cell. Another form of glandular trichome consists of ten or twelve cells forming a globular head supported on a short stalk.

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[1] Abstract of a paper published in *American Druggist*, March, 1889.

Besides the usual fluids for clearing up or bleaching the tissues, Schulze's reagent (chloroiodide of zinc) will prove very useful in examining the powder. It will bring out very clearly the hairs and collenchyma cells, which are stained blue, while the sclerenchyma cells and the pollen grains will assume a yellow color. At the same time, of course, starch, a very common adulteration of insect powder, will become plainly distinguishable if present.

The author also directs attention to the presence in the powder of conspicuous fragments consisting of papillæ covering the upper epidermis of the marginal corolla. The petals of other related species are similarly constructed. The pollen grains of the species mentioned are likewise similar in structure. Mœller (*Mikroskopie*, etc., 1886) stated that the petals contain no stomata; but the author found stomata quite numerous on the marginal corolla of *Chrys. cinerariæfolium*, especially on the lower side.

CHEMISTRY OF THE COCA BASES.[1]

By Dr. O. Hesse.

The somewhat vague discussion that appeared about two years ago in pharmaceutical journals in regard to "amorphous cocaine" induced me to publish my observations on that subject in the *Pharmaceutische Zeitung*[2] while expressly reserving to myself the further investigation of the bases cocamine and hygrine then described very briefly. Liebermann has,[3] however, without waiting for the completion of that inquiry, lately published his investigation of isatropylcocaine, which is for the most part nothing else than the cocamine discovered by me in 1886. Though the investigation of cocamine was at that time all but complete so far as relates to cocamine, I have thought it desirable to continue the inquiry, more especially since the crude bases I operated upon had not been subjected to the action of permanganate, as was the case with the material on which Liebermann operated. However, the subject of my investigation has also been touched by Frankfeld,[4] and therefore in order to avoid further collision it appears desirable to make known at once the results I have arrived at so far.

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[1] Translated from the *Berichte*, xxii. 665. Reprinted from *Phar. Jour. and Trans.*, April 27, 1889.

[2] *Pharmaceutical Journal*, xviii. 71, 437. *Amer. Jour. Phar.*, 1887, 454; 1888, 47.

[3] See "The Month," in *Phar. Jour.*, Sept. 29, 1888, and Feb. 2, 1889.

[4] *Berichte*, xxii. 133.

In the first place I must mention that two sorts of coca leaves are now met with in commerce. The one sort is derived from *Erythroxylon Coca;* it was formerly investigated by Erdmann and Lossen, and was for some time the only material employed in the preparation of cocaine. Subsequently a second sort came into the market, originating from a variety of *Erythroxylon* growing in Jamaica and St. Lucia, which has been regarded, though perhaps incorrectly, as a variety of the well-known coca plant and termed *Nova-granatense.* It is chiefly this latter kind of coca that has hitherto been used in North Germany for making cocaine.

Cocamine was obtained by me from the last mentioned variety of coca leaves, and from a parcel that contained chiefly that base to the extent of nearly 0·6 per cent. In operating upon the crude base with petroleum spirit some part of the cocamine remained undissolved and by repeatedly dissolving that in dilute acetic acid and precipitating with ammonia the base could soon be rendered sufficiently pure for analysis. In the following statement of the results thus obtained the figures marked A relate to the base precipitated from a dilute solution and perfectly crystalline. Those marked B relate to the hydrochloride dried at the ordinary temperature over sulphuric acid.

	A.		B.
	Dried at the normal temperature.	Dried at 53° C.	
C.....	67·46	67.43	59·71
H.....	6·99	7·09	6·81
N.....	4·33	—	—

These results agree well with the formulæ $C_{17}H_{21}NO_4$ and $C_{17}H_{21}NO_4HCl$, by which I considered the composition of cocamine was represented, especially since platinum determinations gave corresponding results. However, a subsequent determination of chlorine in the hydrochloride gave only 9·11 per cent. This discordant result induced me to examine more closely the products of decomposition, and in that way I ascertained that the true formula of cocamine is $C_{19}H_{23}NO_4$. Hence the substances represented by A and B were really $C_{19}H_{23}NO_4+\frac{1}{2}H_2O$ and $C_{19}H_{23}NO_4HCl+H_2O$.

The attempt to determine the water in the pure base was unsuccessful. When heated to 90°-95° C. it melted, but there was no loss of weight. On heating to 120° C. the loss of weight was very near that corresponding to $\frac{1}{2}H_2O$, but the examination of the residue showed that some methyl alcohol must have been given off as well as water.

By long continued heating at this temperature a point is reached at which the decomposition of the base goes on rapidly and a refreshing odor is given off. This is probably due to the formation of the methyl ester of cocaic acid.

The hydrochloride undergoes decomposition even more readily than the base itself. Even at 100° C. it gives off, together with one molecule of water, a certain amount of methyl chloride; if the salt be heated for some hours to 120° C. the residue contains only traces of chlorine. This decomposition takes place according to the following equation:—

$$C_{19}H_{23}NO_4HCl+H_2O=C_{18}H_{21}NO_4+CH_3Cl+H_2O.$$

The residue thus left is chiefly cocamylecgonine $C_{18}H_{21}NO_4$, but owing to a secondary change it contains some cocaic acid.

A similar decomposition takes place when the water solution of the hydrochloride is boiled for some time, but then the methyl is given off chiefly in the state of methyl alcohol, and on cooling the cocamylecgonine separates as a colorless or yellowish oil. When the solution of the salt is mixed with hydrochloric acid, the decomposition is not only promoted, but the cocamylecgonine produced is also split up into ecgonine and cocaic acid. $C_{18}H_{21}NO_4+H_2O=C_9H_{15}NO_3+C_9H_8O_2$.

I have given the name of cocaic acid to the product thus formed, because it is characteristic of coca. To purify this acid the crude product is boiled with lime and water. From a dilute solution of the lime salt hydrochloric acid precipitates the acid in a crystalline form; by recrystallization from boiling glacial acetic acid it is obtained in the form of small colorless laminæ which melt at 266° C. Cocaic acid is sparingly soluble in ether, but it dissolves more readily in hot alcohol, and on cooling crystallizes out in needles The composition of cocaic acid is represented by the formula $C_9H_8O_2$. The lead salt $(C_9H_8O_2)_2Pb+H_2O$ crystallizes in small needles.

Cocaic acid is in fact nothing else than the substance that has been meanwhile described by Liebermann as γ-isatropic acid, but the melting point assigned to it by that chemist is incorrect and too high.

In the residue left after treating the crude cocaic acid with lime there was a lime salt of another acid that dissolved readily in ether, and crystallized from the ether solution in long flat prisms. The quantity obtained was too small for analysis.

After removing this acid, the hydrochloric solution left on evaporation a residue of ecgonine hydrochloride. It melted at 234°-238° C.

with considerable frothing. Liebermann gives the melting point of ecgonine hydrochloride as 246° C., but the whole of the alkaloid would have been decomposed long before reaching that temperature. This decomposition begins in fact far below 234° C., about 200° C., and its commencement is recognizable by the crackling of the crystals. The platinum salt, which is obtainable in several forms as laminæ, prisms and granular crystals, contained 25·26 per cent. platinum, and the formula $(C_9H_{15}NO_3)_2PtCl_6H_2$ requires 24·93 per cent.

Professor Stockman informs me that the physiological action of cocamine is similar to that of cocaine, but somewhat weaker, so that it must be given in larger doses; its anæsthetic action is especially weak. Experiments that I made upon myself confirm Stockman's observations, and I wish to point out that I was unable to detect any poisonous effect of cocamine. This is the more remarkable, since Lieberman states that the so-called γ-isatropyl-cocaine does not act like cocaine, but as a heart poison. An explanation of this discrepancy will perhaps be found further on.

Attempts were made to obtain cocamine from the crude bases that remained dissolved by petroleum spirit after the cocaine had been separated from that solution, but without success. It was only after the mass dissolved by dilute sulphuric acid had been treated with permanganate until no further reduction took place that a product was obtained by fractional precipitation, which when boiled with dilute hydrochloric acid gave for the most part ecgonine and cocaic acid, together with methyl chloride. At the same time there was obtained a minute quantity of a brownish-yellow oil, which resisted the action of the boiling acid. The same result was obtained in operating upon a specimen of isatropyl-cocaine sent to me by Professor Stockman.

When the crude bases obtained by fractional precipitation were dissolved in ether, and the solution evaporated, there remained a syrupy mass, which when heated for some time to 60° C., no longer dissolved completely in dilute acids. But the portion insoluble in dilute acid was dissolved by ammonia. The solution gave white flocculent precipitates with barium chloride and dilute acids. The substance could be obtained pure by repeated solution in ammonia and fractional precipitation with hydrochloric acid. When dried in the air it could be rubbed to a yellowish-white powder that melted near 120° C., and was readily soluble in ether, ammonia and caustic soda, but not in dilute acids. When heated with concentrated hydrochloric acid this sub-

stance did not give off methyl, but when boiled with dilute acid it melted to a yellowish oil, and after some long time was completely decomposed, yielding ecgonine and an acid that was not more closely examined. The composition of this substance is represented by the formula $C_{18}H_{19}NO_4$.

It is probable, therefore, that the acid product contained two atoms less hydrogen than cocaic acid, and that its relation to that acid is the same as that of acrylic acid to propionic acid. For that reason I give the acid the name of cocrylic acid, the substance it is derived from that of cocrylecgonine, and the methylated cocrylecgonine, which would correspond with cocamine, that of cocrylamine. The brownish-yellow oil observed in the decomposition of the so-called isatropylcocaine by hydrochloric acid may be for the most part only cocrylecgonine, and its production may be due to the presence of some cocrylamine in the isatropylcocaine. That moreover is probably the reason that the product obtained by Liebermann from the crude bases possessed poisonous characters.

The liquid from which cocamine had been separated by fractional precipitation by ammonia still contained substances that could be extracted by petroleum spirit and obtained as a tolerably liquid oil that was readily soluble in dilute hydrochloric acid. Platinic chloride added to the solution gave a pale yellow precipitate which contained 19·44 per cent. platinum after drying at 110° C. The last fraction gave only 15·22 per cent. platinum, and therefore the substance was a mixture.

This mixed substance, when boiled with dilute hydrochloric acid, yielded some ecgonine as hydrochloride and an oily non-volatile base, together with some hygrine. The latter was separated by adding baryta and shaking out with ether. There were also obtained cocaic acid, apparently corresponding in quantity to the ecgonine, much cinnamic acid[1] and some benzoic acid. The cinnamic acid was separated in the form of a lime salt, crystallizing in small needles very sparingly soluble in cold water and consisting of $(C_9H_7O_2)_2Ca+3H_2O$.

The melting point of the acid was 131° C., or rather less than that observed by Kraut, Liebermann and Frankfeld. With permanganate it yielded benzoic aldehyd. In regard to the acid said to be benzoic it may be mentioned that its melting point was 121° C., and that it gave the reactions characteristic of benzoic acid.

[1] The occurrence of cinnamic acid among the products of decomposition of coca bases was known to me long before the publication of the fact by Frankfeld.

These observations show distinctly that the oil in question did not contain any cinnamylcocaine. It has already been stated that judging from the platinum salt of hygrine its formula is $C_{12}H_{13}N$, and that it may be a trimethylchinoline, corresponding to methylated piperidine; but I shall return to this subject on a future occasion.

From the bases of true coca there was obtained, after separating cocaine, a fraction which had the same percentage composition as cocamine, but differed from that substance by its solubility in petroleum spirit and in other particulars. That substance I termed cocaidine. On decomposing it with dilute hydrochloric acid it was however ascertained that a sensible quantity of cocaic acid was formed, as well as other acids and an oily product that was not readily decomposed by hydrochloric acid. Consequently cocaidine is a mixture, but its further investigation must be deferred for want of material. From the solution out of which that mixture had been precipitated by ammonia oily bases could be obtained as above described, which on boiling with dilute hydrochloric acid behaved in the same manner as those obtained from the other kind of coca, with this difference, however, that the principal part of the acid product in this case was benzoic acid.

From my investigation I consider I am justified in concluding that the "amorphous" bases from true coca consist chiefly of benzoyl compounds of an oily nonvolatile base, together with some cocamine, while on the contrary, those obtained from the other kind of coca—the so-called Truxillo—consist essentially of cocamine and the cinnamyl compounds of that oily base; also that cocamine is in both cases accompanied by another base containing two atoms less hydrogen, which I have named cocrylamine. In both cases the amorphous bases yield some hygrine, but whether it be a product or an educt I have not been able to decide.

THE "IODINE ABSORPTION" EQUIVALENT OF ESSENTIAL OILS.[1]

By R. H. Davies, F. I. C., F. C. S.,

Chemist to the Society of Apothecaries.

Some months ago, when estimating a sample of reduced iron by means of iodine solution, I observed that the indiarubber stopper of

[1]Read before the Pharmaceutical Society of Great Britain, at an Evening Meeting in London, Wednesday, April 10. Reprinted from *Phar. Jour. and Trans.*, April 13, p. 821.

the bottle in which the digestion was taking place had apparently become altered; and a further experiment on a weighed portion of pure unvulcanized rubber conclusively showed that under these circumstances the rubber absorbed iodine.

About the same time I found that some eucalyptus oil to which aqueous solution of iodine in potassium iodide was added deprived the latter of its iodine, becoming at the same time so much heavier that after repeating the treatment a few times the oil sank to the bottom of the aqueous liquid. These observations induced me to look into such literature as I could find bearing on the subject of iodine absorption by hydrocarbon and essential oils, and this appeared to be somewhat meagre, consisting mainly of the statement that many essential oils reacted violently with solid iodine, and a suggestion in Watt's "Dictionary of Chemistry," vol. iv., p. 190, that since aromatized waters decolorized solution of iodine by virtue of the essential oils dissolved in them, it should be possible to utilize the reaction as a means of estimating the strength of such waters.

No experiments were recorded as to the amount of iodine which given weights of various oils would absorb under these conditions, and up to the present time, so far as I am aware, the necessary data for making this a practical analytical process have not been given.

Having had frequent occasion lately to make use of the process devised by von Hübl for estimating the iodine absorption power of fixed oils, it naturally occurred to me that this useful analytical method would yield results of value when applied to essential oils, and I propose to bring some of the results I obtained before the members of the Society this evening in the hope that they may prove interesting.

Von Hübl's method of working is the following:—25 grams of iodine and 30 grams of mercuric chloride are dissolved in absolute alcohol, and the solution made up to 1 litre. Twenty cc. of this solution are then added to a known weight (0.4 gram) of the oil to be examined, which has been dissolved in 10 cc. of chloroform, and the mixture is allowed to stand some hours, after which it is diluted with 15 cc. of a 10 per cent. solution of potassium iodide, then with 150 cc. of water, and the iodine remaining in the free condition is estimated by titration with standard sodium hyposulphite solution. As the strength of the alcoholic solution varies somewhat with its age it is necessary to perform a blank experiment with each determination of one, or of a series of samples of oil, and from the difference between

the amount of hypo solution required for the blank experiment (when no oil is present) and that required for the liquids containing oil, but otherwise exactly similar to the blank experiment, the amount of iodine that has gone from the free to the combined condition through the agency of the oil can easily be calculated.

This amount is usually expressed as proportional to 100 parts by weight of oil, and constitutes the "iodine absorption equivalent" of the oil. It is not to be assumed that the number represents the amount of iodine actually absorbed by the oil, since, without doubt, the process is usually, if not invariably, a substitution process, in which, for each iodine atom entering into the composition of the oil a second combines with the hydrogen thus displaced, and this ultimately forms the familiar mercuric iodide, which can be obtained in crystals upon evaporation of the aqueous liquid.

At the time I commenced this work, and indeed, for some time later, I was not aware that the application of this process to essential oils had been attempted, but Mr. A. H. Allen, F. I. C., whom I consulted on this point, eventually forwarded a reference which, when followed up, showed that in 1886 Mr. C. Barenthin, a pharmacist of Berlin, had applied the process to some eighteen essential oils, and had published his results in the *Archiv der Pharmacie* for October of that year.

Some preliminary experiments showed at once that there was a very great difference in the amount of absorption of iodine by different essential oils.

In order to get some idea as to whether much or little iodine would be taken up, 2 drops of essential oil were dissolved in about 5 cc. chloroform in a small flask, and the "Hübl reagent" added, noting the volume required before the decolorization began to become slow.

This preliminary examination enabled me to divide the oils roughly into four classes, according to their reaction with the Hübl reagent.

In the first class the absorption was very little or none, under 1 cc. of iodine solution being required. This comprised essential oil of almonds, natural and artificial, oils of cassia, chamomile, cinnamon, cummin, cloves, pimento, mustard, American peppermint, Japanese mint, and gaultheria.

In the second class, comprising English dill and caraway oils, the reaction was slow in starting, but afterwards considerable.

In the third class the absorption was to a moderate extent only;

not more than 2 cc. was required, though reaction commenced at the first addition. This class comprised oils of calamus, eucalyptus, fir wool, pennyroyal, sassafras, sandal wood, spearmint.

In the fourth class the decolorization of iodine solution was rapid and abundant, 3 to 6 cc. of reagent being required. This class contained oils of English aniseed, star-anise, bergamot, copaiba, cubeb, fennel, juniper, lavender, English, foreign and "spike," lemon, origanum, rosemary, rue, nutmeg, turpentine and terebene.

The estimation of the amount of "absorption" was then proceeded with, a weighed quantity of the oil being allowed to stand in contact with an excess of the iodine solution during one night. It was soon found that the differences in absorption power were very much greater in the case of essential than in that of fixed oils. In the latter the lowest recorded is about 9 per cent., and the highest about 160 per cent.; but amongst volatile oils, whilst some do not absorb any appreciable amount of iodine, others will remove from solution four times their weight, or 400 per cent.

On this account the uniform quantity of oil, 0·4 gram, always taken when fixed oils are operated upon, is not applicable. A very much smaller quantity must be taken of certain oils, *e. g.*, those of the fourth class above, or a much larger quantity of the reagent than the prescribed 20 cc., which is not so convenient.

The estimations that have so far been made are shown in the table on the opposite page.

In some cases (following Barenthin) I have used a solution of double the strength in iodine and mercuric chloride given above; it is possible by this means to work with a larger quantity of oil; the results do not materially differ. In this case a correspondingly greater quantity of the potassium iodide must be employed in the final operation. The alcohol I have used was the strongest commercial spirit of wine, containing usually 93 per cent. alcohol by weight (*i. e.*, 67 O. P.), having ascertained experimentally that this strength answered as well as absolute alcohol and gave similar results.

It is desirable to make two blank experiments and take the mean, rather than depend upon one, when taking the absorptions of a series of oils.

As an example, the numbers obtained in working one of these will perhaps not be out of place. Taking sample 28:—

Oil of lavender, French grown.

Amount taken, 0·1277 gram.

Hyposulphite solution required 41·75 cc.

Strength of hyposulphite solution, 100 cc.=1·3034 iodine.

Blank experiment (1), 20 cc. "Hübl" (double strength) required 70·55 cc. hypo.

Blank experiment (2), 20 cc. "Hübl" (double strength) required 70·65 cc. hypo.

Mean of the two blank experiments, 70·6 cc.

70·6—41·75=28·85 cc., the equivalent of "absorbed" iodine;

$$\text{then } \frac{1{\cdot}3034 \times 28{\cdot}85 \times 100}{100 \times {\cdot}1277} = 294{\cdot}46$$

As examples of the agreement between determinations of the same oil I give the amounts of oil used, and the absorption equivalent found, in the individual instances of half a dozen oils for which mean results are given in the table.

Sample.			Absorption. Per cent.	Mean.
3.	Aniseed oil	(*a*) ·0556	188·3	
		(*b*) ·0573	189·2	
		(*c*) ·1536	191·8	189·7
4.	Bergamot	(*a*) ·0475	274·9	
		(*b*) ·0489	277·4	276·1
5.	Chamomile	(*a*) ·1014	68·18	
		(*b*) ·0947	68·04	68·1
6.	"	(*a*) ·0957	71·8	
		(*b*) ·0960	72·4	72·1
7.	"	(*a*) ·216	66·5	
		(*b*) ·1415	64·5	65·5
8.	Caraway	(*a*) ·0443	254·2	
		(*b*) ·0433	255·6	254·9

I venture to direct attention to some points which appear to have interest, and to draw such conclusions as the work so far done seems to me to warrant.

I may say that I feel the utmost confidence in the genuineness of those oils indicated as obtained from the English distiller. In almost all cases the manufacturer has placed these at my disposal specially for purpose of examination, and the agreement between these oils is closer than I should have expected from a consideration of the complex nature of essential oils generally. The samples of oil of chamomile, clove, cubebs, peppermint and sandal-wood well illustrate this agreement.

Oil of cloves (and pimento) I placed in the first class in the preliminary examination as absorbing but little iodine, and was much surprised to find how high the equivalent was.

It appears as if the reaction goes on much more slowly than is usual. In another respect these oils were peculiar. After titrating with the hyposulphite solution the chloroformic solution of oil is usually colorless, and remains so. In the case of these oils, however, it had a deep orange-red color. The cause of this has not yet been ascertained.

Two results of examination of the lavender oil are interesting:—

1. The absorption equivalent of the Mitcham oil from the English variety of *Lavandula vera* is practically identical with that of the oil from the French variety, though the grower informs me that in color and habit the plants differ much from one another.

2. It is noteworthy that the number obtained in a 50 per cent. mixture of French and English lavender oil is very close to the mean of the equivalents of the component oils (actually found 286·2, theory for equal parts 284·7).

The results of the lemon oil examination are suggestive. It is commonly stated that in spite of the assurances of the makers this oil as found in commerce is habitually adulterated with a prepared turpentine.

The absorption equivalent of lemon oil is high, but not so high as that of turpentine; and it is a fact that the lowest equivalent in these seven samples (328·3) is that of an oil that was specially obtained for me three or four years ago by the agent in London of some manufacturers, for purposes of examination. The other samples (which were offered commercially) are all distinctly higher, ranging from 340·3 to 355·1.

The oils of peppermint and of Japan field mint resemble one another somewhat closely in their equivalents, being about 50 per cent. One sample of American peppermint, said to have been prepared from plants procured from Mitcham and cultivated in America, has a much lower iodine absorption equivalent (82) than either of the other three examined, which range from 121·8 to 143·9. Why the American oil equivalent should be more than twice as high as the English I am quite unable to say.

In the preliminary examination of the oils of peppermint I sometimes found that after standing, the chlorofom having in part evapo-

rated, a very permanent green solution was obtained, which had a marked red fluorescence, and also that certain samples of English oil, and all the samples of American oil in my possession, gave a magnifi-

Name of Oil.	Whence Obtained.	Iodine Absorption per cent.	Estimations made.
1. Oil of almonds, essential	English distiller.	No absorp.	Mean of 2 results.
2. " " prussic acid removed	"	"	" 2 "
3. " aniseed, Russian, 1888	"	189·7	" 2 "
4. " bergamot, 1888	Purchased.	276·1	" 2 "
5. " chamomile, 1887	English distiller.	68·1	" 2 "
6. " " 1888	"	72·1	" 2 "
7. " " 1886 or earlier	Purchased.	65·5	" 2 "
8. " caraway, English	English distiller.	254·9	" 2 "
9. " cassia	Purchased.	159·5	" 2 "
10. " celery	English distiller.	311·6	" 2 "
11. " cinnamon	Purchased.	189·5	" 2 "
12. " clove (a) 1887	English distiller.	362·5	" 2 "
13. " " (b) half from clove stems, 85	"	366·6	One result.
14. " " (c), 1885	"	355·1	"
15. " " (d), 1889	"	349·5	Mean of 3 results.
16. " cubebs (a), 1888	"	226·8	One result.
17. " " (b), 1885	"	223·1	"
18. " " (c), 1889	"	226·0	Mean of 6 results.
19. " cardamoms	"	139·3	" 3 "
20. " cummin, 1877 or earlier	Unknown.	81·6	" 2 "
21. " dill, 1888	English distiller.	257·1	" 5 "
22. " fennel, 1877 or earlier	Unknown.	158·3	One result.
23. " juniper, 1889	English distiller.	337·3	Mean of 3 results.
24. " " foreign	Purchased.	363·9	" 2 "
25. " lavender, English, 1886	Distiller.	265·5	One result.
26. " " Mitcham, 1888	"	274·9	"
27. " " (Mitcham grown) French variety	"	273·9	"
28. Oil of lavender (French grown)	Purchased.	294·5	"
29. " " French (best)	"	282·7	"
30. " " mixed equal parts, French and English		286·2	"
31. Oil of lemon, special from agent (a)		328·3	"
32. " " (b), 1883	Purchased.	340·3	"
33. " " (c), 1888		345·3	"
34. " " (d), "	Sample submitted.	348·9	"
35. " " (e) "	"	348·0	"
36. " " (f), "	"	345·6	"
37. " " (g), "	"	355·1	"
38. " nutmeg, English, 1889	English distiller.	308·3	Mean of 3 results.
39. " " foreign, 1888	Purchased.	321·5	" 2 "
40. " parsley, English, 1889	Distiller.	255·0	" 3 "
41. " peach kernel, English	"	No absorp.	"
42. " pennyroyal, foreign, 1887	Purchased.	188·9	" 2 "
43. " peppermint, English (a), 1887	Distiller.	51·2	" 2 "
44. " " " (b), 1887	"	49·6	" 2 "
45. " " " (c), 1888	"	57·7	" 2 "
46. " " American (a), 1887	Purchased.	132·2	" 2 "
47. " " " (b), 1888	Sample from importer.	143·9	" 2 "
48. " " " (c), 1888	"	121·8	" 2 "
49. " " " Mitch. (d), 1888	"	81·9	" 2 "
50. Oil of peppermint, Japanese (a), 1887	Purchased.	48·1	" 2 "
51. " " " (b) (English grown), 1888	From distiller.	43·5	One result.
52. Oil of rosemary, foreign, 1887	Purchased.	325·0	Mean of 2 results.
53. " sandal wood, English (a), 1888	From distiller.	226·6	" 2 "
54. " " " " (b), 1888	"	233·9	" 3 "
55. " savin, foreign, 1881	Purchased.	279·5	" 2 "
56. " turpentine	"	377·0	" 12 "
57. " spearmint, English	"	207·3	" 2 "
58. " calamus, 1888	"	181·4	" 2 "

In addition to these oils, the following solid derivatives of essential oils have been examined:—

59. Anethol from English oil of aniseed, old	Prepared.	177·4	One result.
60. Anethol from English oil of aniseed, new	"	182·9	"
61. Anethol from English star-anise oil	"	177·8	"
62. Camphor	Purchased.	0·46	Mean of 2 results.
63. Menthol	Prepared.	0·12	" 2 "
64. Thymol	Purchased.	171·5	" 2 "

cent violet color when the Hübl reagent was carefully added to their chloroformic solution.

This color changes gradually through blue into the green first observed, which it becomes after three or four days. The red fluorescence is well marked. The fact that somewhat similar colors are produced by agency of nitric acid on peppermint oil is, of course, familiar, having been pointed out by Professor Flückiger in 1871 (*Pharm. Journ.*, [3], i., p. 682). From such experiments as I have been able to make, I conclude that the color reactions produced by the iodine solution are very much finer, and are effected much more rapidly than those produced by nitric acid. The Japanese oils do not give any violet or blue. Before leaving these oils, I think it right to give the numbers assigned to such of them as were examined by Mr. Barenthin. Turpentine, 300; clove, 270; caraway, 265; bergamot, 260; juniper, 245; rosemary, 185; anise, 164; lavender, 170; calamus, 155; fennel, 140; cinnamon, 100 (*Archiv der Pharmacie*, Oct., 1886).

The solid substances examined were four. Three samples of anethol, one of camphor, menthol and thymol. In these cases, since the substances were regarded as of known chemical composition, and not mixtures, as the oils very generally are, I thought it probable that if any absorption took place it would be in some proportion bearing a definite relation to the molecular composition. The absorption in the cases of camphor and menthol was so small as to suggest the presence of traces of oil, and that the pure substances would not absorb iodine at all. In the case of thymol, there was decided absorption, amounting to 171·5 per cent. of the thymol taken. Now the formula of thymol being $C_{10}H_{14}O$, if two atoms of iodine entered into reaction with one molecule, the percentage absorption would be 169·3, which is very close to that actually found. One cannot speak with certainty until the product has been isolated and examined, but it is probable that mon-iodo thymol results from this reaction.

The anethol was simply separated by cold and dried between bibulous paper. Doubtless there is some adherent oil, which could be separated by crystallization from alcohol. When recrystallized this will be subjected to a further examination. The only conclusion I can at present draw from the very similar absorption equivalents is that the composition of this substance is the same, whether prepared from star-anise oil or that of the true aniseed.

I have not yet been able to try how far this iodine absorption process would serve as a means of estimating the amount of oil in aromatized waters. It seems feasible to shake up a known amount of the water with a little chloroform, and to digest the chloroformic solution with the Hübl reagent, but at present, so far as I know, it has not been tried for this purpose.

In conclusion, I regret that this account is so much less complete than I had hoped to make it. The facts that the subject is of some interest to members of this Society, and that the present is the last meeting for this session, will, I trust, serve to excuse my presenting it in this incomplete form.

My thanks are due in particular to Messrs. Stafford, Allen & Sons, for the very fine series of oils they have furnished me with; also to Messrs. Geo. Atkinson and Sons. J. and R. V. Matthew, of Croydon, Messrs. Stevenson and Howell, Mr. Samuel Lambert, Mr. J. Moss, Mr. R. Morrison, and to Mr. Thomas Hunter for his able assistance in this investigation.

HUMOUS SUBSTANCES.[1]

By F. Hoppe-Seyler.

On the death of plants or parts of plants, substances of a brown color are formed which are called humous substances. Wood, however, often remains white for years. In dry air, or at a high temperature, plants can be dried without browning. The browning of the surface of a cut apple may be taken as a very rapid example of the process. Bacteria do not seem to be concerned in this change. This brown coloration does not occur to any extent in dead animal tissues. It is not, however, due to the chlorophyll of plants, as it occurs equally quickly in plants which contain no chlorophyll. The almost universal distribution of tannic acid and carbohydrates, and especially of cellulose, suggests that these may be sources of the humous substance, or it may come from the hydrocyanic acid, phenol, and nitrogenous compounds of plant tissues.

Pure cellulose when mixed with mud containing micro-organisms, ferments and yields carbonic anhydride and methane in the absence of oxygen, but no humous substance is formed; in the presence of oxygen, the cellulose (filter-paper) still remains quite white; all sorts of

[1] *Zeit. physiol. Chem.*, xiii., 66—121; reprinted from *Jour. Chem. Soc.*, 1889, p. 285.

mud being used in the experiments. By heating with water at 188–200°, or with caustic alkalis, humous substances are formed. Water in glass tubes produced a brown residue, and the liquid was found to contain formic acid, catechol, and protocatechuic acid; when platinum tubes were employed, there was a brown residue, but the other products obtained in glass tubes were absent, as they are due to the decomposition of the humous substance produced by a small quantity of alkali, dissolved out from the glass at the high temperature to which the tubes were subjected. Other experiments were performed with strong alkalis, and the resulting gases, as well as the residue, were analyzed.

The fermentation of wood-gum was found to be similar to that of cellulose; and it is supposed that the lignic acid may be instrumental in the formation of humous substances in turf, peat, etc.

Tannin red, obtained from certain plants by extracting with water, and the phlobaphen of Stähelin and Hofstetter, an amorphous brown substance, are apparently derivatives of tannic acid, and may be included under humous substances. The preparation and properties of a large number of these substances are described. They are formed by the action of alkalis on various carbohydrates (dextrose, lactose, cane-sugar, glycuronic acid, etc.); from various aromatic substances; and those obtained from various vegetable sources are also described. They are amorphous, differing in percentage composition, mostly containing nothing but carbon, hydrogen, and oxygen. A few contain nitrogen, like those described by Udánszky (1887) in urine. A derivative of humous substances called humic acid is described, and various names are given to various other members of the group.

The original paper must be consulted for details concerning their preparation and analysis; the following summary will, however, indicate the methods adopted in their separation:

Humous substances fall into three groups: the first includes those which are soluble neither in caustic alkalis nor in alcohol, but unite with alkalis, forming a slimy mass. This group includes the *humin* and *ulmin* of Mulder. The second group consists of those which are completely soluble in alkalis, and precipitable from such solutions by acids; the precipitate formed is voluminous and jelly-like, and is insoluble in alcohol. A part of the *tannin reds*, and of *humic* and *ulmic* acids, belong to this group. The substances in the third group resemble those in the second with regard to their solubility in alkalis;

but the precipitate produced by acid is easily soluble in alcohol. *Phlobaphen*, a part of *humic* and *ulmic acids*, and the brown acids included under the name *hymatomelanic acids* (which are formed from the members of the first two groups by heating with caustic alkalis) belong to the third group.

NOTES ON ESSENTIAL OILS FROM MESSRS. SCHIMMEL AND CO.'S REPORT.[1]

Angelica Oil.—The results obtained from the parcel of angelica root imported from Japan, to which reference was made in the previous report (see before, p. 326), differ essentially from those experienced with the German drug. The Japanese roots have the same tufted form as the German, but are lighter and nearly white and are provided with stronger rootlets. They are referred to one of two species, *Angelica refracta*, Fr. Schmidt (Jap. "*Senkiyu*"), or *A. anomala*, Lall. (Jap. "*Biyakushi*"), both of which, according to Rein, are cultivated in the open fields of Japan. This Japan angelica root proved to be comparatively very poor in essential oil, the yield being only one-tenth per cent., the oil also being essentially different from commercial angelica oil. Whilst the German distillate has a specific gravity of 0.853 at 20° C., that of the Japanese is 0.912 at the same temperature. At 10° it gives a separation of crystals, and at 0° it solidifies to a paste. The crystalline mass obtained by cooling and draining had the properties of a fatty acid melting at 62°–63° C. The oil boils between 170° and 310° C., the last portion that passes over having a beautiful blue-green color. The residue solidifies upon cooling and consists principally of the non-volatile fatty acid. The odor of the oil is unusually intense and persistent, more acrid than that of the German angelica oil, but possessing the characteristic suggestion of musk. The cost of this oil deprives it of any industrial importance.

Anise Oil.—The statement made on "high authority" in the paper read at a recent evening meeting of the Pharmaceutical Society by Mr. J. C. Umney, to the effect that for every pound of aniseed oil from *Pimpinella Anisum* a thousand pounds of star-anise oil are met with, and the subsequent statement of Mr. John Moss that he would put the proportion as one to ten thousand, are sharply criticized as underestimating the importance of the aniseed oil industry. Messrs. Schimmel say that in their factory alone under ordinary circumstances 7000 kilos of aniseed are worked up daily, yielding 200 kilos of aniseed oil. They place the annual production of oil from seeds of *Pimpinella Anisum* at 42,000 kilos, or equal to about 1400 canisters of star-anise oil, and they raise the question whether the annual production of star-anise oil amounts to 1400 canisters, to say nothing of one thousand or ten thousand times that quantity. Messrs. Schimmel make this correction in the hope that in future such questions may be discussed "with more

[1] From the April *Bericht* of Messrs Schimmel and Co. of Leipzig; reprinted from *Phar. Jour. and Trans.*, April 6 and 20.

care and upon a better basis, bearing in mind that the centre of gravity of the manufacture of essential oils lies in Germany, and not in England."

Bay Oil (*Myrcia acris*).—Under this heading the following two recipes for the preparation of "bay rum" are given:

I.

Bay Oil	2 drachms.
Pimento Oil	1 drachm.
Cloves Oil	10 drops.
Alcohol (95 per cent.)	½ gallon.
Water	½ gallon.

Mix and allow to stand for several days, then filter.

II.

Bay Oil	1 ounce.
Alcohol (95 per cent.)	½ gallon.

Mix and allow to stand for a fortnight. Then add one gallon of good Jamaica rum. The bay rum made according to this recipe is said to correspond with the imported article.

Betel Oil.—A statement made in a previous report to the effect that the essential oil of betel leaves contained eugenol was considered to be opposed to a report by Professor Eykman upon the composition of a sample of betel oil examined by him; a fresh investigation has therefore been made with the following result. The sample of betel oil examined was a slightly brown colored liquid, sp. gr. 1·024 at 15° C. It consisted up to about two-thirds or three-fourths of a phenol, the boiling-point of which in partial vacuum, under a pressure of 12 mm., lay at 131-132° C.; under ordinary atmospheric pressure it underwent decomposition on boiling. The specific gravity of the phenol was 1·067 at 15° C. Examination of the oxidation products, acetyl compound and methyl ether showed that this compound was not eugenol, but an isomer, the composition of the new compound and of eugenol being represented as follows:

New Compound.

$$C_6H_3\begin{bmatrix}[1]C_3H_5\\[3]OH\\[4]OCH_3.\end{bmatrix}$$

Eugenol.

$$C_6H_3\begin{bmatrix}[1]C_3H_5\\[3]OCH\\[4]OH.\end{bmatrix}$$

The second constituent of betel oil boiled practically between 250° and 275° C., had a very agreeable tea-like odor, and consisted for the greater part of a sesquiterpene ($C_{15}H_{24}$), cubebene, which is characterized by its dihydrochlorate melting at 117–118° C. This composition differs considerably from that given by Professor Eykman, but how far the difference may depend upon the oil examined by Professor Eykman having been distilled from fresh leaves, whilst that examined by Messrs. Schimmel was distilled from dried leaves has not been determined.

Bergamot Oil.—Some question having been raised recently as to the natural color of bergamot oil, Messrs. Schimmel publish some information on the subject obtained from two of the largest producers in Reggio. One of them says: "This essence occurs for the most part of a brown-yellow color. A certain quantity approximates more to green, but this is an essence prepared only from unripe fruit. In commerce it seldom occurs pure, since it

is ordinarily mixed with the essence prepared later from ripe fruit. Carefully examined in a glass tube it cannot properly be called 'green,' but there is always a yellow color perceptible. The emerald green essences which have been exported from Messina are such as have been allowed to stand for a long time in badly tinned vessels, and the color is due to oxide of copper." The second correspondent says: "After the working of the bergamot fruit the essence obtained is honey colored, and it is usually put forward and sought for of this color. The green color is acquired when the oil is allowed to stand a certain time—about seven or eight months—in the vessels; it attacks the tinning and becomes green through contact with the copper. This is the correct explanation of the two colors; any other is false."

Cajeput Oil.—Referring to a large consignment from Macassar, Messrs. Schimmel state that according to their experience cajeput oil directly imported is always genuine and trustworthy, but that in intervening commerce, and, as they hear, especially in America, it gets adulterated with camphor oil. On practical grounds an adulteration with eucalyptus oil is not to be feared, as that oil is more costly.

Calamus Oil.—Reporting on the Japanese calamus root referred to in the previous *Bericht* (see before, p. 326) it is stated that these roots do not differ externally from European calamus roots, and are no doubt derived from the same species. They contain 5 per cent. of a highly aromatic essential oil, which is considerably heavier than the German calamus oil, having a specific gravity of 0·991 at 16° C. It boils between 210° and 290° C.; if the distillate be collected in two fractions, the lower portion has the characteristic calamus odor, while the higher boiling portion gives off the peculiar sesquiterpene odor. Japanese calamus oil also differs from the European in solubility, 1 part dissolving in 500 parts of 50 per cent. spirit, the German oil requiring 1000 parts of spirit.

Camphor Oil.—Under this name the light-boiling portion of the crude camphor oil appears to find enormously increasing industrial application as a substitute for turpentine oil. More detailed information is now given concerning its characters and composition. It is stated that after the preliminary runnings, smelling disagreeably of aldehydes and acids, the oil begins to boil at about 158° C. The first fraction, boiling between 158° and 162° C., consists of right-handed pinene, identified by the formation of the hydrochlorate, $C_{10}H_{16}HCl$, as well as of nitrosoterpene, melting at 130°, obtained by treatment of pinene nitrosochloride with alcoholic potash. In the portion boiling between 169° and 171° phellandrene was detected, but in very small quantity; it was identified by its nitrite, melting at 102°. Dipentene was found in camphor oil by Wallach, and the tetrabromide and nitrosylchloride compound may be easily obtained from the fraction boiling at 180°. The occurrence of terpineol in camphor oil has not been determined with certainty. Whilst the formation of a compound having the composition $C_{10}H_{16}2HI$, as well as of terpin hydrate, dipentene and terpinene, rendered its presence highly probable, it was, on the other hand, rendered doubtful

by repeated failures to obtain the dipentene dihydrochlorate and tetrabromide. There is also in camphor oil a considerable quantity of a hydrocarbon, boiling about 260° to 270°, from which was obtained the hydrochloric acid compound, melting at 117°, characteristic of the sesquiterpene cubebene. In the highest boiling fractions of camphor oil occurs an intensely blue colored oil, which is probably identical with the constituent, boiling at about the same temperature, occurring in chamomile, millefolium, wormwood and other oils. The constituents of camphor oil found up to the present are—

Boiling point.	Constituent.	Formula.
158°–162°	Pinene	$C_{10}H_{16}$.
170°	Phellandrene	$C_{10}H_{16}$.
176°	Cineol	$C_{10}H_{18}O$.
180°	Dipentene	$C_{10}H_{16}$.
204°	Camphor	$C_{10}H_{16}O$.
215°–218°	Terpineol	$C_{10}H_{17}OH$.
232°	Safrol	$C_{10}H_{10}O_2$.
248°	Eugenol	$C_{10}H_{12}O_2$.
274°	Sesquiterpene	$C_{15}H_{24}$.

Cananga Oil.—The opinion is expressed that the finer sorts of Java cananga oil can be used for all purposes for which the ordinary qualities of ylang-ylang oil suffice, since both oils are derived from the same plant and the extraordinary differences in quality are due to the more or less perfect methods of preparation.

Chamomile Oil.—In order to prevent as much as possible the original blue color of this oil from changing to green it is recommended that it should be protected carefully from the influence of light and heat.

VARIETIES.

Antipyrin is stated by Dr. Herbert Snow (*Brit. Med. Jour.*) to relieve the pain of incurable cancer, and to act best when given with morphine, the analgesic effect of which it greatly enhances.

Lactic Acid in Tuberculous Diarrhœa.—Ségary and Aune recommend lactic acid, 2, 6, or 8 grams in twenty-four hours, in the treatment of diarrhœa of phthisis. They report 9 successful cases.—*Jour. Amer. Med. Assoc.*, March 2, 1889.

Creasote in Phthisis.—In the clinik of Dr. Verstracten (*Rev. gén. Clin. et Théra.*), creasote has been found of service in phthisis. It may be given in the following ways:—

(1). One part may be mixed with 20 of cod liver oil. Of this mixture 3 to 6 teaspoonfuls must be administered daily.

(2). It may be combined with an equal part of almond oil, and five to ten drops of the compound given three times daily in two tablespoonfuls of warm milk or broth.

(3). Six parts of creasote may be added to eight of tincture of nux vomica. Of this, eight to ten drops may be given three times daily in two teaspoonfuls of sweetened water, before meals.

It is stated that creasote increases appetite, relieves the breathing and decreases the expectoration and cough.—*Med. Chronicle*, Feb., 1889.

Dr. Robinson (*Am. Jour. Med. Sci.*, Jan. 1889) regards beechwood creasote as a remedy of great value in the treatment of pulmonary phthisis, particularly during the first stage. Not only does it lessen or cure cough, diminish, favorably change, and occasionally stop sputa, relieve dyspnœa in very many instances; it also often increases appetite, promotes nutrition, and arrests night-sweats. It does *not* occasion hæmoptysis, and rarely causes disturbance of the stomach or bowels, except in cases in which it is given in *too large* doses.

MINUTES OF THE PHARMACEUTICAL MEETING.

MAY 31st, 1889.

The meeting was called to order and Mr. Wm. B. Webb was asked to preside. The minutes of the last meeting were read, and no objections being made, they were approved.

Mr. Meyer showed a bottle containing about a pint of water, which was about half of what was poured off from the tar contained in a gallon can which was purchased for a gallon of tar. After discussion it was thought that the subject was of sufficient interest to be referred to the meeting to be held next fall.

A paper upon *Oil of Camphor*, by Professor Trimble and Mr. H. J. M. Schroeter was read and illustrated with a great variety of specimens, exhibiting the commercial oils and the fractions obtained during the investigation. The interesting paper called forth a great deal of discussion in reference to the marked difference in appearance and odor of the fractions, and to the variation of the commercial oil, more particularly as compared with the oil of camphor as it had been in commerce forty or fifty years ago. Professor Maisch showed a sample of the oil which had been in his possession nearly thirty years. Originally it was liquid during the summer, and deposited some camphor only in winter, while now much camphor remains crystallized even in summer.

Dr. Lowe exhibited a specimen of *asafetida* which contained but about 20 per cent. of matter soluble in alcohol. Professor Maisch stated that according to Dymock the purest asafetida which occurs in distinct tears, was consumed in the East, while the article seen in our commerce consisted of white opaque tears free from mineral additions, but imbedded in a yellowish mass, mixed with earthy matters, principally calcium sulphate. On removing the tears a mass would be left agreeing in appearance and other characters with the specimen shown by Dr. Lowe. The kind called *hingra* in India is ordinarily found in commerce. The Persian asafetida and probably the greater part of that coming from Afghanistan is the product of Ferula Scorodosma; while Ferula Narthex is indigenous to Thibet. The

fetid translucent variety called *hing* in India is derived, according to Mr. Dymock, from Ferula alliacea.

Mr. Wallace Procter said that in 1867 his father brought from England some asafetida in distinct opaque tears. Asafetida is also seen in our commerce consisting of tears, to which usually a small quantity of the yellowish mass with earthy matter is adhering; occasionally a softer kind, containing little of the adulterated mass is met with. The Actuary stated that about 1867 a lot of asafetida was put upon the market which consisted of 7 or 8 per cent. of soluble matter, the remainder being nearly altogether sulphate of calcium. It agreed with Pereira's stony asafetida.

Mr. C. Carroll Meyer exhibited a specimen of *amber resin of guaiacum* and read some notes referring to the testing, which showed the article to be pure (see page 286). By distilling the alcohol from a quantity of tincture of guaiacum for which there was no further use, Prof. Maisch said he had obtained pure guaiac resin, which strongly resembled the sample submitted by Mr. Meyer.

Dr. Lowe exhibited a *graduated measure* which, after being broken in the foot, had been fastened in a tin box-lid with plaster of Paris. Several members stated they had done this for years and found such measures more durable than glass-footed ones.

Mr. Beringer exhibited a sample of *glycolin*, a petroleum product made in this city. It is one of the lower paraffins, is possessed of peculiar solvent powers, and on account of its non-irritating qualities and freedom from odor is recommended as a substitute for glycerin in the treatment of wounds, affections of the skin and scalp, and for the treatment of inflamed mucous surfaces. The sample submitted was colorless and had a specific gravity of 0·8662; it is readily miscible with fixed and volatile oils with the exception of castor oil. Chloroform and ether mix with it in all proportions; alcohol and glycerin are insoluble in it, and carbolic acid in liquid state is immiscible; but the crystallized acid forms an opalescent white solution; creasote, however, readily dissolves into a clear solution. It is also a solvent for iodine, bromine, sulphur and beta-naphthol, naphthalin, menthol, thymol, camphor and iodoform. Some of the alkaloids are likewise soluble in it, veratrine yielding a two per cent. solution, cocaine a six per cent. solution. On treating with about two per cent. of quinine on cooling a gelatinous mass is formed. It is also a good diluent for oleic acid and oleates.

Mr. McIntyre alluded to the expunging of *compound resin cerate* from the pharmacopœia, and expressed his opinion that it should be restored.

Mr. Mœrk read some extracts from a paper by Dr. Bernardy that Mr. England had sent to him for that purpose detailing the superiority of *mercuric iodide* over the bichloride of mercury as an antiseptic showing that solutions of one part in four thousand of the solvent were fully equal to one part of the mercuric chloride in two thousand of solvent, and at the same time less toxic and less irritant; the solution of the mercuric iodide is always made by means of potassium iodide.

Professor Maisch exhibited a log of *Pinus palustris*, which had been sent to Mr. Bullock for the college from North Carolina. It illustrates the method

of obtaining *turpentine;* a box as it is technically termed is cut into the trunk of the tree, the bark above this box is cut away, and the sapwood is hacked so that the oleoresin runs down into the box, and when a sufficiency has collected it is drawn off. In answer to an inquiry it was explained that as the bark was removed only on one side the tree still lived and would furnish turpentine for a number of years.

There being no further business the meeting adjourned until the third Tuesday in October.

THOS. S. WIEGAND,
Registrar.

PHARMACEUTICAL COLLEGES AND ASSOCIATIONS.

New York College of Pharmacy.—The chair of botany and materia medica having become vacant by the resignation of Prof. W. De F. Day, the vacancy has been filled by the election of Dr. Henry H. Rusby, whose name has become well known for his botanical researches and his explorations in Arizona and in South America. Prof. Arthur H. Elliott, Ph. D., who has had charge of the chemical laboratory since 1888, and lectured on physics since 1886, will hereafter lecture also on inorganic chemistry.

The Massachusetts College of Pharmacy held its twenty-first annual commencement March 15th, the number of graduates being thirty. The degree was conferred by President Canning and the valedictory was delivered by Prof. G. F. H. Markoe.

The National College of Pharmacy at Washington, D. C., had its commencement May 16, with a graduating class of thirteen.

St. Louis College of Pharmacy.—Prof C. O. Curtman has tendered his resignation, and at a meeting of the Board held May 2, the following resolution was unanimously adopted :

Resolved, that the executive board of the St. Louis College of Pharmacy accept with regrets the resignation of Professor C. O. Curtman, who has been connected with this college for the last eleven years as professor of chemistry and has largely contributed to the success of building up said college.

A committee has been entrusted with the preliminary steps for filling the vacancy.

The Florida Pharmaceutical Association held its third annual meeting at Ocala, April 16. Routine business was transacted and a committee was appointed for the purpose of securing a less defective pharmacy law than the present one. The present officers are H. C. Cushman, Pensacola, President; William Anderson, S. B. Leonardi and J. S. Frazer, Vice-Presidents; S. P. Watson, Jacksonville, Secretary, and E. Delouest, Ocala, Treasurer.

The Louisiana Pharmaceutical Association met at its seventh annual meeting in New Orleans April 10, president C. L. Keppler in the chair. The different officers and committees presented their reports, and the President delivered the annual address. A committee appointed for the purpose called upon the Louisiana Medical Society then in session in New Orleans, and the latter resolved that the "National Formulary" be regarded as the

standard for the unofficinal preparations contained therein. The Association voted to contribute annually $250 towards the salary of the instructor in pharmacy in the Tulane University. The salary of the Secretary was fixed at $100. There are 473 registered pharmacists and 80 qualified assistants in the State. Dr. Fred. Hoffmann, New York, and Professor C. L. Diehl, Louisville, were elected honorary members. The officers for the ensuing year are: F. M. Brooks, Baton Rouge, President; J. B. Lavigne and F. C. Godbold, Vice-Presidents; L. F. Chalin, Secretary; Mrs. E. Rudolph, Corresponding Secretary, and E. Brand, Treasurer. The next meeting will be held in New Orleans, on the first Wednesday in April, 1890.

The New Jersey Pharmaceutical Association assembled in Bridgeton at its nineteenth annual meeting May 22 and 23, President G. H. White in the chair. Mayor DuBois tendered the hospitality and freedom of the city, to which the President replied. Among the reports of officers was the final one of the first treasurer, the venerable William Rust of New Brunswick, who during the nineteen years had received $5,478.72, and paid out $5,322.76, leaving a cash balance of $155.96. Mr. Rust declined a re-election.

Greetings were exchanged by telegraph with the Nebraska Association, then in session in Lincoln.

A Committee appointed to report on the sale of liquors by pharmacists had secured the opinion of Hon. Cortlandt Parker, according to which pharmacists may sell intoxicants as a medicine, but not as a beverage; the object of the State laws was stated to be to advance morals, and not to retard human progress, and the honest and prudent pharmacist would have no trouble in obeying those laws.

The Board of Pharmacy reported for the past year to have registered 55 pharmacists on diplomas, and to have examined 90 candidates of whom 39 passed; the total number of registered pharmacists in the State is 1600.

Among the subjects presented under the head of "trade interests" was a modification of what is known as the rebate plan, intended to prevent the underselling of proprietary articles; it was discussed and finally adopted.

A report on the revision of the pharmacopœia was discussed and adopted; the question of weights and measures attracted particular attention.

Several papers were read, among others on "The coloring of medicines," by Aug. Drescher, and on "Pharmacy in Skin Diseases, by F. B. Kilmer.

Visits were made to several glass factories, and the visiting ladies enjoyed a drive through the city and suburbs.

Next year's meeting will be held in Jersey City. The officers elected for the present year are: President, Henry P. Thorn, Medford; vice-presidents, Charles P. Kinsella, Paterson, and F. R. Davis, Morristown; secretary, Charles F. Dare, Bridgeton; treasurer, William F. Townley, Newark.

The Tennessee Pharmaceutical Association met at Memphis, May 8th. The usual routine business was attended to. A prominent feature of the transactions was the pharmacy law which failed to pass the legislature. F. J. Dowdy, Memphis, was elected president; Secretary Thompson and Treasurer Laurent of Nashville were re-elected.

OBITUARY.

Warren de la Rue, D. C. L., F. R. S., died in London April 19, at the age of 74 years. He was a native of Guernsey, was educated in Paris, and succeeded his father as the head of the firm of Thomas de la Rue & Co., from which he retired in 1880. To scientific literature he contributed a number of papers on electricity and galvanism, a memoir on the coloring matter and other constituents of cochineal (1847), and with his friend Hugo Müller researches on hydrocarbons, resins, nitroglycerin etc., the memoir of special interest to pharmacy being one on some constituents of rhubarb (1857), in which the investigators proved the sediment formed in tincture of rhubarb to contain chrysophanic acid, erythroretin, phæoretin and aporetin, which compounds had been prepared (1844) directly from the root by Schlossberger and Doepping.

Oskar Schlickum died in Winningen near Coblenz April 4th, aged 51 years. He was born in the same town in 1838, received a good education, in 1856 became an apprentice in his father's pharmacy, and after clerking in several stores, passed the State's examination in 1865, and in the following year became the successor of his father. He was the author of a number of practical works, such as commentaries on the German pharmacopœias, condensed dictionaries of pharmacy, chemistry and botany, on the education of apprentices &c. His numerous practical papers were contributed to the *Pharmaceutische Zeitung* and to the *Archiv der Pharmacie*, and many of them are found, mostly as abstracts, in previous volumes of this journal. For about four years the deceased was chairman of the committee for the preliminary revision of the German pharmacopœia.

John Franklin Wilgus, Ph. G., class 1876, was killed May 5th, while crossing the tracks of the Pennsylvania Railroad at Bridesburg, Philadelphia, on the way to his place of business at 4627 Frankford Avenue; his remains were interred at Bordentown N. J.

Samuel S. Garrigues, Ph. G., Ph. D., deceased, at Ann Arbor, Michigan, after a protracted sickness, May 16th, 1889, in the sixty-first year of his age. Among the Huguenot exiles who left their homes in the province of Languedoc, in France, by reason of the revocation of the edict of Nantes by Louis XIV in 1685, were three brothers, Matthew, Francis and John De la Garrigue. Escaping from France they landed on the island of St. Christopher, (one of Caribbee group belonging to Great Britain), and from thence they afterwards made their way to Philadelphia. Uniting in religious creed with the Church of England the brothers became members of the congregation of old Christ's Church on Second street. (The first church building was erected in 1695. Watson's Annals of Philadelphia). Samuel, one of the children of Matthew, subsequently withdrew from the church, and with his family united himself with the Society of Friends. This was the great-great grandfather of the subject of our memoir. The family name in the course of time became anglicized to Garrigues. Samuel S. Garrigues was born at the N. E. corner of Market and Sixth streets, Philadelphia, September 7, 1828. His early education was received in the schools maintained by the Society

of Friends. He afterwards entered the public schools of this city, and graduated from the High School in 1847. His knowledge of pharmacy was acquired in the store of his father, Edward B. Garrigues, Tenth and Fairmount Avenue, and with the late Frederick L. John, on Race street, above Third street. Graduating from the Philadelphia College of Pharmacy in 1851 he went the same year to Europe. After a year spent at the University in Berlin, he entered the University of G ttingen and, after a course of two years, graduated from that institution, receiving the degree of Ph. D. During the vacations of his student life abroad he made pedestrian trips through Germany and into Switzerland and Italy. Botany being one of his favorite studies, he collected during these excursions an extensive and valuable herbarium, which he afterwards presented to the University of Michigan.

Returning to Philadelphia in 1854, he engaged with Mr. Magee in the manufacture of chemicals for photography; the firm being known as Garrigues & Magee, on Fifth street above Arch street. After the dissolution of the firm in 1857 he removed to New York, where he remained until 1863, when the development of the salt interest in Michigan led to his connection with that industry as a chemist. In 1869, he was appointed State inspector of salt in Michigan, and held that office until his declining health made it necessary for him to withdraw from active duties. The reports prepared by him on the salt and lumber interests are valuable State papers on the resources of Michigan.

In 1864 he received a commission to act as assistant surgeon to the 29th Michigan Volunteers, and while the regiment was encamped in the State he was the only medical officer in charge. To malarial disease contracted at this time is attributed his subsequent declining health.

Dr. Garrigues became a member of the American Pharmaceutical Association in 1855, and while residing in Philadelphia was a member of the Franklin Institute and of the Academy of Natural Sciences.

After removing to Michigan he took an active interest in the advancement of Pharmacy in that State, was at one time president of the Michigan Pharmaceutical Association, and was interested in the passing of the Pharmacy Act of Michigan.

He was married in 1864 to Miss Addele M. Burt, of Saginaw, Michigan. His widow, a son and a daughter survive him.

The father of Dr. Garrigues, the oldest living member of the Philadelphia College of Pharmacy, resides in this city; he is now in his 93d year.

C. T. B.